



ENCYCLOPÆDIA BRITANNICA.



Encyclopædia
Britannica

1, 1

A

A,
abbreviat.

A, THE first letter of the alphabet, in all the known languages of the world, that of Ethiopia excepted, in which it is the 13th. It has deservedly the first place in the alphabet, on account of its simplicity, very little more being necessary to its pronunciation than opening the mouth.

In the English language **A** is the mark of three different sounds, termed, by our grammarians, the *broad*, the *open*, and the *slender A*. The first resembles that of the German **A**, is found in several monosyllables, as *wall*, *salt*, &c. and is pronounced as *au* in *cause*. It is probable that the Saxons expressed only this broad sound of the letter, as it is still commonly retained in the northern districts of England, and universally throughout Scotland; as, *tauk* for *talk*, *wauk* for *walk* or *wake*.—The open **A** resembles that of the Italians in *adagio*, and is the same with that of *a* in *father*, *rather*, &c. The slender sound is peculiar to the English language, and resembles the sound of the French diphthong *ai* in *pais*, or their *a* masculine, or perhaps it is a middle sound between them; it is exemplified in *place*, *waste*, &c. also in *toleration*, *justification*, and all other words ending with *ation*.

A is sometimes added afterwards in burlesque poetry; in which case it only makes an additional syllable without any alteration of the sense, as the interjection **O** very often does in our ballads. It is also sometimes redundant, as in the words *arise*, *awake*, &c. which are not different in signification from *rise*, *wake*, &c.

It is sometimes a word, either noun or interjection; in which last case it is commonly an expression of grief, and joined with the aspirate, as *ah!* When a noun, it is only with respect to itself; as *great A*, *little a*, &c.

A is very frequently used as an article; in which case it has no plural signification, and is used to denote the number *one*, as *a house*, *a field*, &c. When placed as an article before any of the vowels, *y* and *w* only excepted, it is joined with the letter *n*; as *an island*, *an orator*, &c.—In the three following cases it is a preposition. 1. When it goes before a participle, or noun derived from a participle; as, *I am a doing this* or *that*. 2. When used before local surnames, as *Cornelius a Lapide*, *Thomas a Kempis*, &c. 3. When it is used in composition; as, *a foot*, *a sleep*, &c. In some instances it denotes the proportion of one thing to another; as, *so much a week*, *a man*, *a head*, &c.

A, among the ancients, was a numeral letter, and

VOL. I. Part I.

signified 500; and when a dash was added on the top, **Ā**, 5000.

A, in the Julian calendar, is the first of the seven DOMINICAL letters. It had been in use among the Romans long before the establishment of Christianity, as the first of the eight *nundinales litteræ*; in imitation whereof it was that the dominical letters were first introduced.

A is also an abbreviation used with different intentions. Hence,

A, among logicians, is used to denote an universal affirmative proposition; according to the verse,

Afferat A, negat E, verum generaliter ambe.

Thus, in the first figure, a syllogism consisting of three universal affirmative propositions, is said to be in *Bār-bā-rā*; the *A* thrice repeated, denoting so many of the propositions to be universal, &c. See *BARBARA*.

A, among the Romans, was used in the giving of votes or suffrages.—When a new law was proposed, each voter had two wooden ballots put in his hand; the one marked with a capital *A*, signifying *antiquo*, *q. d. antiquam volo*; and the other with *V. R.* for *ut i rogas*. Such as were against the law, cast the first into the urn; as who should say, *I refuse it*, *I antique it*; or, *I like the ancient law*, and desire no innovation.

A, in the trials of criminal causes, also denoted absolution: Whence Cicero, *pro Milonē*, calls *A, littera salutaris*, a saving letter.—Three ballots were distributed to each judge, marked with the letters, *A* for *absolvo*, *I acquit*; *C* for *condemno*, *I condemn*; and *N. L.* for *non liquet*, *It is not clear*. From the number of each cast into the urn, the prætor pronounced the prisoner's fate. If they were equal in number, he was absolved.

A, in the ancient inscriptions of marbles, &c. occasionally stands for *Augustus*, *ager*, *aiunt*, &c. When double, it denotes *Augusti*; when triple *aurum argentum*, *as*; and sometimes its meaning can only be known by the rest of the inscription. Isidore adds, that when it occurs after the word *miles* (soldier), it denotes him young. On the reverse of ancient medals, it denotes them struck by the city of Argos, sometimes by that of Athens; but on coins of modern date, it is the mark of Paris.

A, as an abbreviation, is also often found in modern writers; as *A. D.* for *anno Domini*; *A. M.* *artium magister*, master of arts, &c.

A, the letter *a*, with a line above it thus, **ā**, is used

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A,
abbreviat.

A - Algebra

131 JAN

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Aaron.

in medical prescriptions for *ana*, of each; sometimes it is written thus, *āā*: e. g. *R. Mel. Sacchar. & Mann. ā, vel āā, ʒj.* i. e. Take of honey, sugar, and manna, of each one ounce.

A, put to bills of Exchange, is in England an abbreviation for *accepted*, and in France for *accepté*. It is likewise usual among merchants to mark their sets of books with the letters A, B, C, &c. instead of the numbers, 1, 2, 3, &c.

A.A.A. The chemical abbreviation for Amalgama, or Amalgamation.

AA, the name of several rivers in Germany and Switzerland.

AACH, a little town in Germany, in the circle of Suabia, near the source of the river Aach, and almost equally distant from the Danube and the lake Constance. It belongs to the House of Austria. E. Long. 9, 0. Lat. 47. 55.

AAHUS, a little town in Germany, in the circle of Westphalia and bishopric of Munster. It is the capital of Aahus, a small district; has a good castle; and lies north-east of Coesfeldt. E. Lon. 7. 1. N. Lat. 52. 10.

AAM, or HAAM, a liquid measure in common use among the Dutch, and containing 128 measures called *mingles*, each weighing nearly 56 ounces averdupoise; whence the *Aam* contains 288 English, and 148½ pints Paris measure.

AAR, the name of two rivers, one in Switzerland, and another in Westphalia in Germany. It is also the name of a small island in the Baltic.

AARASSUS (anc. geog.), a town of Pisidia, in the Hither Asia, thought to be the Anassus of Ptolemy.

AARON, high-priest of the Jews, and brother to Moses, was by the father's side great grandson, and by the mother's grandson of Levi. By God's command he met Moses at the foot of mount Horeb, and they went together into Egypt to deliver the children of Israel: he had a great share in all that Moses did for their deliverance; the scriptures call him the prophet of Moses, and he acted in that capacity after the Israelites had passed over the Red-Sea. He ascended mount Sinai with two of his sons, Nadab and Abihu, and seventy elders of the people; but neither he nor they went higher than half way, from whence they saw the glory of God; only Moses and Joshua went to the top, where they staid forty days. During their absence, Aaron, overcome by the people's eager intreaties, set up the golden calf, which the Israelites worshipped by his consent. This calf has given rise to various conjectures. Some rabbies maintain that he did not make the golden calf; but only threw the gold into the fire, to get rid of the importunities of the people; and that certain magicians, who mingled with the Israelites at their departure from Egypt, cast this gold into the figure of a calf. According to some authors, the fear of falling a sacrifice to the resentment of the people by giving a refusal, made Aaron comply with their desire: and they allege also, that he hoped to elude their request, by demanding of the women to contribute their ear-rings, imagining they would rather choose to remain without a visible deity, than be deprived of their personal ornaments. This affair of the golden calf happened in the third month after the Israelites came out of Egypt. In the first month of the

following year, Aaron was appointed by God high-priest; which office he executed during the time that the children of Israel continued in the wilderness. He died in the fortieth year after their departure from Egypt, upon mount Hor, being then 123 years old; A. M. 2522, of the Julian period 3262, before the Christian æra 1452. With regard to the attempts of the Egyptian magicians to imitate the miracles performed by his rod, see some remarks under the article MAGICIAN.

AARON and JULIUS (Saints), suffered martyrdom together, during the persecution under the Emperor Dioclesian, in the year 303, about the same time with Saint Alban the protomartyr of Britain. We are nowhere told what their British names were, it being usual with the Christian Britons, at the time of baptism, to take new names from the Greek, Latin, or Hebrew. Nor have we any certainty as to the particulars of their death; only that they suffered the most cruel torments. They had each a church erected to his memory; and their festival is placed, in the Roman martyrology, on the first of July.

AARON, or Harun. *Al Raschid*, a celebrated khalif, or Mahometan sovereign of the Saracen empire; whose history is given under the article BAGDAD.

AARON Harifschon, a learned rabbi and CARAITE in the 15th century, wrote an Hebrew grammar, printed at Constantinople in 1581; probably the same with Aaron the caraites, who wrote a commentary on the five books of Moses, which is in MS. in the French king's library.

AARSENS (Francis), Lord of Someldyck and Spyck, was one of the greatest ministers for negotiation the United Provinces could ever boast of. His father, Cornelius Aarsens, was Register to the States; and being acquainted with Mr Plessis Mornay, at the Court of William Prince of Orange, he prevailed upon him to take his son under him, with whom he continued some years. John Olden Barnevelt, who presided over the affairs of Holland and all the United Provinces, sent him afterwards agent into France, where he learned to negotiate under those profound politicians Henry IV. Villeroy, Sillery, Rossie, Jaonnin, &c. and he acquitted himself in such a manner as to obtain their approbation. Soon after, he was invested with the character of ambassador, being the first who was recognised as such by the French court; at which time Henry IV. declared, that he should take precedence next to the Venetian minister. He resided in France 15 years; during which time he received great marks of esteem from the king, who created him a knight and baron; and for this reason he was received amongst the nobles of the province of Holland. However, he became at length so odious to the French court, that they desired to have him recalled. He was afterwards deputed to Venice, and to several German and Italian princes, upon occasion of the troubles in Bohemia. He was the first of three extraordinary ambassadors sent to England in 1620, and the second in 1641; in which latter embassy he was accompanied by the Lord of Brederode as first ambassador, and Heemsvliet as third, to treat about the marriage of Prince William, son to the Prince of Orange. He was likewise ambassador-extraordinary at the French court in 1624; and the Cardinal de Richlieu having just

Aaron,
Aarsens.

Aarsens
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Aba,

just taken the administration of affairs into his hands, and knowing he was an able man, made use of him to serve his own purposes. He died in a very advanced age; and his son, who survived him, was reputed the wealthiest man in Holland.

AARSENS (Peter), a painter, called in Italy Pietro Longo, because of his stature, was born at Amsterdam 1519. He was eminent for all kinds of subjects; but was particularly famous for altar-pieces, and for representing a kitchen with its furniture: he had the pain to see a fine altar-piece of his destroyed by the rabble in the insurrection 1566, though a lady of Alcaer offered 200 crowns for its redemption.

AARTGEN, AERTGEN, a painter of merit, was the son of an woolcomber, and born at Leyden in 1498. He worked at his father's trade until he had attained the age of eighteen; and then, having discovered a genius for designing, he was placed with Cornelius Engelheitz, under whom he made a considerable progress in painting. He became so distinguished, that the celebrated Francis Floris went to Leyden out of mere curiosity to see him. He found him inhabiting a poor half ruined hut, and in a very mean style of living: He solicited him to go to Antwerp, promising him wealth and rank suitable to his merit; but Aartgen refused, declaring that he found more sweets in his poverty than others did in their riches. It was a custom with this painter never to work on Mondays, but to devote that day, with his disciples, to the bottle. He used to stroll about the streets in the night, playing on the german flute, and in one of these frolics was drowned in 1564.

AASAR (anc. geog.), a town of Palestine, in the tribe of Judah, situated between Azotus and Ascalon. in Jerome's time it was an hamlet.

AB, the eleventh month of the civil year of the Hebrews, and the fifth of their ecclesiastical year, which begins with the month Nisan. It answers to the moon of July; that is, to part of our month of the same name, and to the beginning of August: it consists of thirty days. The Jews fast on the first of this month, in memory of Aaron's death; and on the ninth, because on that day both the temple of Solomon, and that erected after the captivity, were burnt; the former by the Chaldeans, and the latter by the Romans. The same day is also remarkable among that people for the publication of Adrian's edict, wherein they were forbid to continue in Judea, or even to look back when at a distance from Jerusalem, in order to lament the desolation of that city. The 18th of the same month is also a fast among the Jews; because the lamp in the sanctuary was that night extinguished, in the time of Ahaz.

AB, in the Syriac calendar, is the name of the last summer-month. The first day of this month they called *Suum Miriam*, the fast of the virgin, because the eastern Christians fasted from that day to the fifteenth, which was therefore called *Fatr-Miriam*, the cessation of the fast of the virgin.

ABA (or rather ABAU) HANIFAH or HANFA, surnamed Al-Nooma, was the son of Thabet, and born at Coufah in the 80th year of the Hegira. This is the most celebrated doctor of the orthodox Mussulmans, and his sect holds the principal esteem among the four which they indifferently follow. Notwithstanding this,

he was not very well esteemed during his life, inasmuch that the khaliff Almanfor caused him to be imprisoned at Bagdad, for having refused to subscribe to the opinion of absolute predestination, which the Mussulmans call Cadha. But afterwards Abou Joseph, who was the sovereign judge or chancellor of the empire under the khaliff Hadi, brought his doctrine into such credit, that it became a prevailing opinion, That to be a good Mussulman was to be a Hanifite. He died in the 150th year of the Hegira, in the prison of Bagdad aforesaid: and it was not till 335 years after his death, that Melick Schah, a sultan of the Selgiucidan race, built for him a magnificent monument in the same city, whereto he adjoined a college peculiarly appropriated to such as made a profession of this sect. This was in the 485th year of the Hegira, and Anno Christi 1092. The most eminent successors of this doctor were Ahmed Benali, Al Giassas, and Al Razi who was the master of Nassari; and there is a mosque particularly appropriated to them in the temple of Mecca.

ABA, *Abas*, *Abos*, or *Abus*, (anc. geog.), the name of a mountain of Greater Armenia, situated between the mountains Niphatos and Nibonis. According to Strabo, the Euphrates and Araxes rose from this mountain; the former running eastward, and the latter westward.

ABA. See ABÆ.

ABACÆNA (anc. geog.), a town of Media, and another of Cana in the Hither Asia.

ABACÆNUM (anc. geog.), a town of Sicily, whose ruins are supposed to be those lying near Trippi, a citadel on an high and steep mountain not far from Messina. The inhabitants were called *Abacenini*.

ABACATUAIA, in ichthyology, a barbarous name of the zeus vomer. See ZEUS.

ABACH, a market-town of Germany, in Lower Bavaria, seated on the Danube. It is remarkable for Roman antiquities, and for springs of mineral waters which are said to be good for various distempers. E. Long. 11. 56. Lat. 48. 53.

ABACINARE, or ABBACINARE, in writers of the middle age, a species of punishment, consisting in the blinding of the criminal, by holding a hot basin or bowl of metal before his eyes.

ABACK (a sea-term), the situation of the sails when the surfaces are flatted against the masts by the force of the wind. The sails are said to be *taken aback* when they are brought into this situation, either by a sudden change of the wind, or by an alteration in the ship's course. They are *laid aback*, to effect an immediate retreat, without turning to the right or left; or, in the seaphrase, to give the ship *stern-way*, in order to avoid some danger discovered before her in a narrow channel, or when she has advanced beyond her station in the line of battle, or otherwise. The sails are placed in this position by slackening their lee-braces, and hauling in the weather ones; so that the whole effort of the wind is exerted on the forepart of their surface, which readily pushes the ship astern, unless she is restrained by some counteracting force. It is also usual to spread some sail aback near the stern, as the mizen-top-sail, when a ship rides with a single anchor in a road, in order to prevent her from approaching it so as to entangle the flukes of it with her slackened cable, and thereby loosen it from the ground.

Aba
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Aback.

Abacot
||
Abacus.

ABACOT, the name of an ancient cap of state worn by the kings of England, the upper part whereof was in the form of a double crown.

ABACTORS, or ABACTORES, a name given to those who drive away, or rather steal, cattle by herds, or great numbers at once; and are therefore very properly distinguished from *fures* or thieves.

ABACUS, among the ancients, was a kind of cupboard or buffet. Livy, describing the luxury into which the Romans degenerated after the conquest of Asia, says they had their *abaci*, beds, &c. plated over with gold.

ABACUS, among the ancient mathematicians, signified a table covered with dust, on which they drew their diagrams; the word in this sense being derived from the Phœnician *abak*, dust.

ABACUS, in architecture, signifies the superior part or member of the capital of a column, and serves as a kind of crowning to both. Vitruvius tells us the abacus was originally intended to represent a square tile laid over an urn, or rather over a basket. See ARCHITECTURE, n° 15.—The form of the abacus is not the same in all orders: in the Tuscan, Doric, and Ionic, it is generally square; but in the Corinthian and Composite, its four sides are arched inwards, and embellished in the middle with some ornament, as a rose or other flower. Scamozzi uses *abacus* for a concave moulding on the capital of the Tuscan pedestal; and Palladio calls the plinth above the echinus, or boudin, in the Tuscan and Doric orders, by the same name.

ABACUS is also the name of an ancient instrument for facilitating operations in arithmetic. It is variously contrived. That chiefly used in Europe is made by drawing any number of parallel lines at the distance of two diameters of one of the counters used in the calculation. A counter placed on the lowest line, signifies 1; on the 2d, 10; on the 3d, 100; on the 4th 1000, &c. In the intermediate spaces, the same counters are estimated at one half of the value of the line immediately superior, viz. between the 1st and 2d 5; between the 2d and 3d, 50; &c. See the figure on Plate I. where the same number, 1788 for example, is represented under both divisions by different dispositions of the counters.

ABACUS is also used by modern writers for a table of numbers ready cast up, to expedite the operations of arithmetic. In this sense we have *Abaci* of addition, of multiplication, and division.

Chinese ABACUS. See SWANPAN.

ABACUS Pythagoricus, the common multiplication-table, so called from its being invented by Pythagoras.

ABACUS Logisticus, is a rectangled triangle, whose sides, forming the right angle, contain the numbers from 1 to 60; and its area, the facta of each two of the numbers perpendicularly opposite. This is also called a *canon of sexagesimals*.

ABACUS & Palmula, in the ancient music, denote the machinery, whereby the strings of Polyplectra, or instruments of many strings, were struck with a plectrum made of quills.

ABACUS Harmonicus, is used by Kircher for the structure and disposition of the keys of a musical instrument, whether to be touched with the hands or the feet.

Abacus Major, in metallurgic operations, the name of a trough used in the mines, wherein the ore is washed.

ABADDON, is the name which St John in the Revelations gives to the king of the locust, the angel of the bottomless pit. The inspired writer says, this word is Hebrew, and in Greek signifies *Ἀπολλων*, i. e. a *destroyer*. That angel-king is thought to be Satan or the devil: but Mr le Clerc thinks with Dr Hammond, that by the locust which came out of the abyfs, may be understood the zealots and robbers, who miserably afflicted the land of Judea, and laid it in a manner waste, before Jerusalem was taken by the Romans; and that Abaddon, the king of the locust, may be John of Gischala, who having treacherously left that town a little before it was surrendered to Titus, came to Jerusalem, where he soon headed part of the zealots, who acknowledged him as their king, whilst the rest would not submit to him. This subdivision of the zealot party brought a thousand calamities on the Jews.

ABADIR, a title which the Carthaginians gave to gods of the first order. In the Roman mythology, it is the name of a stone which Saturn swallowed, by the contrivance of his wife Ops, believing it to be his new-born son Jupiter: hence it ridiculously became the object of religious worship.

ABÆ, or ABA (anc. geog.), a town of Phocis in Greece, near Helicon; famous for an oracle of Apollo older than that at Delphi, and for a rich temple plundered and burnt by the Persians.

ABAFT, a sea-term, signifying the hinder part of a ship, or all those parts both within and without which lie towards the stern, in opposition to *AFORE*; which see.—*Abast*, is also used as a preposition, and signifies *further ast, or nearer the stern*; as, the barricade stands *abast* the main-mast, i. e. behind it, or nearer the stern.

ABAISSED, *abaisse*, in heraldry, an epithet applied to the wings of eagles, &c. when the tip looks downwards to the point of the shield, or when the wings are shut, the natural way of bearing them being extended.

ABAKA KHAN, the 18th emperor of the Moguls, a wise and clement prince. He reigned 17 years, and is by some authors said to have been a Christian. It may be admitted, indeed, that he joined with the Christians in keeping the feast of Easter, in the city Hanadau, some short time before his death. But this is no proof of his Christianity; it being common, in times of brotherly love, for Christians and Mahometans to join in keeping the same feasts, when each would compliment the other with doing honour to his solemnity.

ABALAK, a town of Siberia, two miles from Tobolsk. E. Long. 64. 10. N. Lat. 57. 1.

ABALIENATION, in law, the act of transferring one man's property to another.

ABALLABA, the ancient name of APPLEBY, a town in Westmoreland, remarkable only for its antiquity, having been a Roman station. W. Long. 1. 4. N. Lat. 55. 38.

ABALUS (anc. geog.), supposed by the ancients to be an island in the German ocean called by Timæus *Basilis*, and by Xenophon Lampfacenus *Baltia*; now the peninsula of Scandinavia. Here, according to Pliny, some imagined that amber dropped from the trees.

ABANA,

Abacus
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Abalus.

Abana
||
Abaris.

ABANA, or AMANA (anc. geog.) a river of Phœnicia, which, rising from Mount Hermon, washed the south and west sides of Damascus, and falls into the Phœnician sea to the north of Tripolis, called *Chrysrheas*, by the Greeks.

ABANGA. See ADY.

ABANO, a town of the Paduano, in the republic of Venice, famous among the ancients for its hot baths.

ABANTES, a people who came originally from Thrace, and settled in Phœcia, a country of Greece, where they built a town which they called *Aba*, after the name of Abas their leader; and if we may credit some ancient authors, the Abantes went afterwards into the Island Eubœa, now called *Negropont*: others say the Abantes of Eubœa came from Athens. The Abantes were a very warlike people, closing with their enemies, and fighting hand to hand.

ABANTIAS, or ABANTIS (anc. geog.), a name of the island Eubœa in the Egean sea, extending along the coast of Greece, from the promontory Sunium of Attica to Thessaly, and separated from Bœotia by a narrow strait called *Euripus*. From its length the island was formerly called *Macris*; afterwards *Abantias* or *Abantis*, from the Abantes, a people originally of Thrace, called by Homer *οπισθεν Κομωυτες*, from wearing their hair long behind, having in a battle experienced the inconvenience of wearing long hair before. From cutting their hair before, they were called *Curetes*.

ABAPTISTON, in surgery, the perforating part of the instrument called a *TREPAN*.

ABARA, a town in the Greater Armenia, under the dominion of the Turks: it is often the residence of the archbishop of Naksivan. Long. 46. 25. Lat. 39. 45.

ABARANER, a town of Asia, in Grand Armenia, belonging to the Turks: it is seated on the river Alingena. Long. 46. 30. Lat. 39. 50.

ABARCA, an ancient kind of shoe used in Spain for passing the mountains with. It was made of raw hides, and bound with cords, which secured the feet of travellers against the snow.

ABARIM, high mountains of steep ascent, separating the country of the Ammonites and Moabites from the land of Canaan, where Moses died. According to Josephus, they stood opposite to the territory of Jericho, and were the last station but one of the Israelites coming from Egypt. Nebah and Pisgah were parts of these mountains.

ABARIS, the Hyperborean; a celebrated sage of antiquity, whose history and travels have been the subject of much learned discussion. Such a number of fabulous stories * were told of him, that Herodotus himself seems to scruple to relate them. He tells us only †, that this Barbarian was said to have travelled with an arrow, and to have taken no sustenance: but this does not acquaint us with the marvellous properties which were attributed to that arrow; nor that it had been given him by the Hyperborean Apollo. With regard to the occasion of his leaving his native country, Harpocration ‡ tells us, that the whole earth being infested with a deadly plague, Apollo, upon being consulted, gave no other answer, than that the Athenians should offer up prayers in behalf of all other nations; upon which, several countries deputed ambassadors to A-

thens, among whom was Abaris the Hyperborean. In this journey, he renewed the alliance between his countrymen and the inhabitants of the island of Delos.

It appears that he also went to Lacedæmon; since, according to some writers ||, he there built a temple consecrated to Proserpine the Salutory. It is asserted, that he was capable of foretelling earthquakes, driving away plagues, laying storms †, &c. He wrote several books, ‡ Porphyrus as Suidas † informs us, viz. Apollo's arrival into the country of the Hyperboreans; The nuptials of the river Hebrus; *Θεογονια*, or the Generation of the Gods; A collection of oracles; &c. Himerius the sophist applauds him for speaking pure Greek; which attainment will be no matter of wonder to such as consider the ancient intercourse there was between the Greeks and Hyperboreans.-----If the Hebrides, or Western islands of Scotland, (says Mr Toland *), were the Hyperboreans of Diodorus †, then the celebrated Abaris was of that country; and likewise a druid, having been the priest of Apollo. Suidas, who knew not the distinction of the insular Hyperboreans, makes him Scythian; as do some others, misled by the same vulgar error; though Diodorus has truly fixed his country in an island, and not on the continent. Indeed the fictions and mistakes concerning our Abaris are infinite: however, it is by all agreed that he travelled quite over Greece, and from thence into Italy, where he conversed familiarly with Pythagoras, who favoured him beyond all his disciples, by instructing him in his doctrines (especially his thoughts of nature) in a plainer and more compendious method than he did any other. This distinction could not but be very advantageous to Abaris. The Hyperborean, in return, presented the Samian, as though he equalled Apollo himself in wisdom, with the sacred arrow, on which the Greeks have fabulously related † that he sat astride, and flew upon it, through the air, over rivers and lakes, forests and mountains; in like manner as our vulgar still believe, particularly those of the Hebrides, that wizards and witches fly whithersoever they please on their broomsticks. The orator Himerius above-mentioned, tho' one of those who, from the equivocal sense of the word *Hyperborean*, seem to have mistaken Abaris for a Scythian, yet describes his person accurately, and gives him a very noble character. "They relate (says he) that Abaris the sage was by nation an Hyperborean, appeared a Grecian in speech, and resembled a Scythian in his habit and appearance. He came to Athens, holding a bow in his hand, having a quiver hanging on his shoulders, his body wrapt up in a plaid, girt about the loins with a gilded belt, and wearing trowsers reaching from his waist downward." By this it is evident (continues Mr Toland) that he was not habitated like the Scythians, who were always covered with skins; but appeared in the native garb of an Aboriginal Scot. As to what relates to his abilities, Himerius informs us, that "he was affable and pleasant in conversation, in dispatching great affairs secret and industrious, quick-sighted in present exigencies, in preventing future dangers circumspect, a searcher after wisdom, desirous of friendship, trusting little to fortune, and having every thing trusted to him for his prudence." Neither the Academy nor the Lycæum could have furnished a man with better qualities to travel so far abroad, and to such wise nations,

* Jamblich, *Vita Pythag.* self seems to scruple to relate them. He tells us only †, that this Barbarian was said to have travelled with an arrow, and to have taken no sustenance: but this does not acquaint us with the marvellous properties which were attributed to that arrow; nor that it had been given him by the Hyperborean Apollo. With regard to the occasion of his leaving his native country, Harpocration ‡ tells us, that the whole earth being infested with a deadly plague, Apollo, upon being consulted, gave no other answer, than that the Athenians should offer up prayers in behalf of all other nations; upon which, several countries deputed ambassadors to A-

† Under the word 'Αἰα-
615.

† Jamblich, *Vita Pythag.* p. 128.

Abarticu-
lation;
||
Abascia.

nations, about affairs no less arduous than important. And if we further attentively consider his moderation in eating, drinking, and the use of all those things which our natural appetites incessantly crave; joining the candour and simplicity of his manners with the solidity and wisdom of his answers; all which we find sufficiently attested; it must be owned, that the world at that time had few to compare with Abaris.

ABARTICULATION, in anatomy, a species of articulation, admitting of a manifest motion; called also *Diarthrosis*, and *Dearticulatio*, to distinguish it from that sort of articulation which admits of a very obscure motion, and is called *Synarthrosis*.

ABAS, a weight used in Persia for weighing pearls. It is 1-8th less than the European carat.

ABAS, in the heathen mythology, was the son of Hypothoon and Meganira, who entertained Ceres, and offered a sacrifice to that goddess; but Abbas ridiculing the ceremony, and giving her opprobrious language, she sprinkled him with a certain mixture she held in her cup, on which he became a newt or water-lizard.

ABAS (Schah) the Great, was third son of Coda-bendi, 7th king of Persia, of the race of the Sophis. Succeeding to his father at 18, in 1585, he found the affairs of Persia at a low ebb, occasioned by the conquests of the Turks and Tartars. He regained several of the provinces they had seized; but death put a stop to his victories in 1629, after a reign of 44 years. He was the greatest prince that had reigned in Persia for many ages; and it was he who made Ispahan the metropolis of Persia; his memory is held in the highest veneration among the Persians.

ABAS (Schah) his grandson, 9th king of Persia, of the race of the Sophis, succeeded his father Sefi at 13 years of age; he was but 18 when he made himself master of the city Candahar, which had surrendered in his father's reign to the Great Mogul, and all the province about it; and he preserved it afterwards against this Indian emperor, though he besieged it more than once with an army of 300,000 men. He was a very merciful prince, and openly protected the Christians: he had formed a design of extending the limits of his kingdom toward the north, and had for that effect levied a powerful army; but death put a stop to all his great designs, at 37 years of age; in 1666.

ABASCIA, or **ABCAS**, a country in Asia, tributary to the Turks, situated on the coast of the Black Sea. The people are poor, thievish, and treacherous, insomuch that there is no trading with them without the utmost caution. Their commodities are furs, buck and tyger skins, linen yarn, boxwood, and bees-wax: but their greatest traffic is in selling their own children, and even one another, to the Turks; insomuch that they live in perpetual distrust. They are destitute of many necessaries of life, and have nothing among them that can be called a town; though we find Anacopia, Dandar, and Czekorni, mentioned in the maps. They have the name of Christians; but have nothing left but the name, any more than the Mingrelians their northern neighbours. The men are robust and active, and the women are fair and beautiful; on which account the Turks have a great value for the female slaves which they purchase from among them. Their customs are much the same as those of the **MINGRELIANS**; which see. E. Long. from 39. to 43. Lat. from 43. to 45.

ABASCUS, a river of Asiatic Sarmatio, which, rising from Mount Caucasus, falls into the Euxine, between Pityus to the east, and Nosis to the west.

ABASITIS (anc. geog.), a tract of Asiatic Mysia, in which was situated the city of Ancyra.

ABASSI, or **ABASSIS**, a silver coin current in Persia, equivalent in value to a French livre, or tenpence halfpenny Sterling. It took its name from Schah Abbas II. king of Persia, under whom it was struck.

ABASSUS (anc. geog.), a town of the Greater Phrygia, on the confines of the *Tolistobagii*, a people of Galatia in Asia.

ABATAMENTUM, in law, is an entry to lands by interposition, i. e. when a person dies seized, and another who has no right enters before the heir.

To **ABATE**, (from the French *abbatre*, to pull down, overthrow, demolish, batter down, or destroy), a term used by the writers of the English common law both in an active and neutral sense; as, To abate a castle, is to beat it down. To abate a writ, is, by some exception, to defeat or overthrow it. A stranger abateth; that is, entereth upon a house or land void by the death of him that last possessed it, before the heir takes possession, and so keepeth him out: wherefore, as he that putteth out him in possession is said to disseize, so he that steppeth in between the former possessor and his heir is said to abate. In the neuter signification thus: The writ of the demandant shall abate; that is, shall be disabled, frustrated, or overthrown. The appeal abateth by covin; that is, the accusation is defeated by deceit.

ABATE, in the manege, implies the performing any downward motion properly. Thus a horse is said to abate or take down his curvets, when he puts both his hindlegs to the ground at once, and observes the same exactness in all the times.

ABATELEMENT, in commerce, a term used for a prohibition of trade to all French merchants in the ports of the Levant who will not stand to their bargains, or refuse to pay their debts. It is a sentence of the French consul, which must be taken off before they can sue any person for the payment of their debts.

ABATEMENT, in heraldry, an accidental figure supposed to have been added to coats of arms, in order to denote some dishonourable demeanour or stain, whereby the dignity of coat-armour was rendered of less esteem. See **HERALDRY**.

ABATEMENT, in law. See **TO ABATE**.

ABATEMENT, in the customs, an allowance made upon the duty of goods, when the quantum damaged is determined by the judgment of two merchants upon oath, and ascertained by a certificate from the surveyor and land-waiter.

ABATIS, an ancient term for an officer of the stables.

ABATION, an erection at Rhodes, as a fence to the trophy of Artemisia, queen of Halicarnassus, Coos, &c. raised in memory of her victory over the Rhodians; or rather as a screen to conceal the disgrace of the Rhodians from the eyes of the world, the effacing or destroying the trophy being with them a point of religion.

ABATOR, in law, a term applied to a person who enters to a house or lands void by the death of the last possessor, before the true heir.

ABATOS (anc. geog.), an island in the lake Moeris, formerly

Abascus
||
Abatos.

Abavo
||
Abbas.

formerly famous for its papyrus. It was the burial place of Osiris.

ABAVO, in botany, a synonyme of the ADANSONIA.

ABB, a term among clothiers, applied to the yam of a weaver's warp. They say also *Abb-wool* in the same sense.

ABBA (anc. geog.), a town of Afric Propria, near Carthage.

ABBA, in the Syriac and Chaldee languages, literally signifies *a father*; and figuratively, a superior, reputed as a father in respect of age, dignity, or affection. It is more particularly used in the Syriac, Coptic, and Ethiopic churches, as a title given to the bishops. The bishops themselves bestow the title *Abba* more eminently on the bishop of Alexandria; which occasioned the people to give him the title of *Baba*, or *Papa*, that is, *Grandfather*; a title which he bore before the bishop of Rome. It is a Jewish title of honour given to certain rabbins called *Tanaites*: and it is also particularly used, by some writers of the middle age, for the superior of a monastery, usually called *ABBOT*.

ABBADIE (James), an eminent Protestant divine, born at Nay in Bern in 1654; first educated there under the famous John la Placette, and afterward at the university of Sedan. From thence he went into Holland and Germany, and was minister in the French church of Berlin. He left that place in 1690; came into England; was some time minister in the French church in the Savoy, London; and was made dean of Killaloe in Ireland. He died at St Mary le Bonne near London, in 1727, aged 73. He was strongly attached to the cause of King William, as appears in his elaborate defence of the revolution, and his history of the assassination-plot. He had great natural abilities, which he improved by true and useful learning. He was a most zealous defender of the primitive doctrine of the Protestants, as appears by his writings; and that strong nervous eloquence for which he was so remarkable, enabled him to enforce the doctrines of his profession from the pulpit with great spirit and energy. He published several works in French that were much esteemed; the principal of which are, *A Treatise on the Truth of the Christian Religion*; *The art of Knowing one's Self*; *A Defence of the British Nation*; *The Deity of Jesus Christ essential to the Christian Religion*; *The History of the last Conspiracy in England*, written by order of King William III.; and *The Triumph of Providence and Religion, or the opening the Seven Seals by the Son of God*.

ABBAS, son of Abdalmothleb, and Mahomet's uncle, opposed his nephew with all his power, esteeming him an impostor and infidel; but in the second year of the hegira, being overcome and made a prisoner at the battle of Bendir in 623, a great ransom being demanded for him, he represented to Mahomet, that his paying it would reduce him to poverty, which would redound to the dishonour of the family. But Mahomet having been informed of Abbas's having secreted large sums of money, asked him after the purses of gold he had left in his mother's custody at Mecca. Abbas, upon this, conceiving him to be really a prophet, embraced his new religion; became one of his principal captains; and saved his life when in imminent danger at the battle of Henain, against the Thakefites, soon after the reduction of Mecca. But besides being a great

commander, Abbas was a famous doctor of the Mussulman law, inasmuch that he read lectures upon every chapter of the Koran, as his nephew pretended to receive them one by one from heaven. He died in 652, and his memory is held in the highest veneration among the Mussulmans to this day.

Abul ABBAS, surnamed *Saffah*, was proclaimed khalif; and in him began the Dynasty of the

ABBASIDES, who possessed the khalifate for 524 years; and there were 37 khalifs of this race who succeeded one another without interruption.

ABBE, in a monastic sense, the same with ABBOT.

ABBE, in a modern sense, is the name of a curious popular character in France, very much mentioned, but very little known, in Britain. The term is not to be rendered in our language, as the existence of the being which it denominates is posterior to the reformation, and no such character was known among the Romanists till about a century and a half ago.

Abbés, according to the strictest definition, are persons who have not yet obtained any precise or fixed settlement in church or state, but most heartily wish for, and would accept of, either, just as it may happen. In the mean while, their privileges are many. They are admissible in all companies, and no degradation to the best, notwithstanding they are sometimes found in the worst. Their dress is rather that of an academic, or of a professed scholar, than of an ecclesiastic; and, never varying in colour, is no incumbrance on the pocket.

These abbés are very numerous, and no less useful. They are, in colleges, the instructors of youth; in private families, the tutors of young gentlemen; and many procure a decent livelihood by their literary and witty compositions of all kinds, from the profoundest philosophy to the most airy romances. They are, in short, a body of men who possess a fund of universal talents and learning, and are incessantly employed in the cultivation of every various branch of literature and ingenuity. No subject whatever escapes them; serious or gay, solid or ludicrous, sacred or profane, all pay tribute to their researches; and as they are conversant in the lowest as well as the highest topics, their fame is equally great in the learned and in the scribbling world.—A distinguishing part of their character too, though we shall but slightly touch it, is their devotion to the fair sex: whose favourites, in return, they have the honour of being in the most enviable degree; the wit and smartness for which they are usually remarkable, being just the very thing that suits the French ladies.—In fine, these abbés are sought after by most people, on various accounts; as they are equally men of business and pleasure, not less expert in the most serious transactions, than fond of enjoying their share in whatever occupies the gay world. Hence they diligently frequent all public spectacles, which are thought incomplete without them; as they compose the most intelligent part of the company, and are the most weighty approvers or condemners of what passes in almost all places.

ABBESS, the superior of an abbey or convent of nuns. The abbess has the same rights and authority over her nuns that the abbots regular have over their monks. The sex indeed does not allow her to perform the spiritual functions annexed to the priesthood, where-with the abbot is usually invested; but there are instances of some abbesses who have a right or rather a privilege,

Abbas
||
Abbess.

Abbeville,
Abbey.

to commission a priest to act for them. They have even a kind of episcopal jurisdiction, as well as some abbots who are exempted from the visitation of their diocesians.

Martene, in his treatise on the rights of the church observes, that some abbesses have formerly confessed their nuns. But he adds, that their excessive curiosity carried them such lengths, that there arose a necessity of checking it. However, St Basil, in his Rule, allows the abbess to be present with the priest at the confession of her nuns.

ABBEVILLE, a considerable city of France in Picardy, and the capital of Ponthieu; the river Somme runs through the middle of it, and divides it into two parts. It has a collegiate church and twelve parish-churches; the most considerable of which are St George's and St Giles's, besides a great number of monasteries and nunneries, a baliwic, and a presidial court. It is a fortified town; the walls are flanked with bastions, and surrounded by large ditches; and was never yet taken; from which circumstance it is sometimes called the *Maiden Town*. The country about it is low, marshy, and dirty. It is pretty well peopled, and is famous for its woollen manufactory. The cloths and stuffs made there are said to be now little inferior to those of England and Holland. The work, however, is assisted by the clandestine importation of English and Irish wool, and workmen from this country. It is about fifteen miles east of the British channel, and ships may come from thence by the river Somme to the middle of the town. E. Long. 2. 6. Lat. 50. 7.

ABBEY, a monastery, or religious house, governed by a superior under the title of *abbot* or *abbess*.

Abbeys differ from *priories*, in that the former are under the direction of an abbot, and the others of a prior: but abbot and prior (we mean a prior conventual) are much the same thing differing in little but the name.

Fauchet observes, that, in the early days of the French monarchy, dukes and counts were called *abbots*, and duchies and counties *abbeys*. Even some of their kings are mentioned in history under the title of *abbots*. Philip I. Louis VI. and afterwards the dukes of Orleans, are called *abbots of the monastery of St Aignan*. The dukes of Aquitaine were called *abbots of the monastery of St Hilary at Poitiers*; and the earls of Anjou, of *St Aubin*, &c.

Monasteries were at first nothing more than religious houses, whither persons retired from the bustle of the world to spend their time in solitude and devotion. But they soon degenerated from their original institution, and procured large privileges, exemptions, and riches. They prevailed greatly in Britain before the reformation; particularly in England: and as they increased in riches, so the state became poor: for the lands which these regulars possessed were *in mortua manu*, i. e. could never revert to the lords who gave them. This inconvenience gave rise to the statutes against gifts in *mortmain*, which prohibited donations to these religious houses: and Lord Coke tells us, that several lords, at their creation, had a clause in their grant, that the donor might give or sell his land to whom he would (*exceptis viris religiosis & Judæis*) excepting monks and Jews.

These places were wholly abolished in England at the time of the Reformation; Henry VIII. having first appointed visitors to inspect into the lives of the
N^o 1.

monks and nuns, which were found in some places very disorderly: upon which, the abbots, perceiving their dissolution unavoidable, were induced to resign their houses to the king, who by that means became invested with the abbey-lands: these were afterwards granted to different persons, whose descendents enjoy them at this day: they were then valued at 2,853,000l. per annum, an immense sum in those days.

Though the suppression of religious houses, even considered in a political light only, was of a very great national benefit, it must be owned, that, at the time they flourished, they were not entirely useless. Abbeys or monasteries were then the repositories, as well as the seminaries, of learning; many valuable books and national records, as well as private evidences, have been preserved in their libraries; the only places wherein they could have been safely lodged in those turbulent times. Many of those, which had escaped the ravages of the Danes, were destroyed with more than Gothic barbarity at the dissolution of the abbeys. These ravages are pathetically lamented by John Bale, in his declaration upon Leland's Journal 1549. "Covetousness," says he, "was at that time so busy about private commodity, that public wealth, in that most necessary and of respect, was not any where regarded. A number of them which purchased these superstitious mansions, reserved of the library-books, some to serve their jacks, some to scour the candlesticks, and some to rub their boots; some they sold to the grocer and soap seller; and some they sent over sea to the book-binders, not in small numbers, but in whole ships full; yea, the universities of this realm are not clear of so detestable a fact. I know a merchant that bought the contents of two noble libraries for 40s. price; a shame it is to be spoken! This stuff hath he occupied instead of grey paper, by the space of more than these ten years, and yet he hath store enough for as many years to come. I shall judge this to be true, and utter it with heaviness, that neither the Britons under the Romans and Saxons, nor yet the English people under the Danes and Normans, had ever such damage of their learned monuments as we have seen in our time."

In these days every abbey had at least one person whose office it was to instruct youth; and the historians of this country are chiefly beholden to the monks for the knowledge they have of former national events. In these houses also the arts of painting, architecture, and printing, were cultivated. The religious houses also were hospitals for the sick and poor; affording likewise entertainment to travellers at a time when there were no inns. In them the nobility and gentry who were heirs to their founders could provide for a certain number of ancient and faithful servants, by procuring them corodies, or stated allowances of meal, drink, and clothes. They were likewise an asylum for aged and indigent persons of good family. The neighbouring places were also greatly benefited by the fairs procured for them, and by their exemption from forest-laws; add to which, that the monastic estates were generally let at very easy rents, the fines given at renewals included.

ABBEYBOYLE, a town of Ireland, in the county of Roscommon, and province of Connaught. W. Long. 8. 32. Lat. 56. 54. It is remarkable for an old abbey.

ABBEY-

Abbey,
Abbey-
boyle.

Abbeyholm ABBEYHOLM, a town in Cumberland, so called from an abbey built there by David king of Scots. It stands on an arm of the sea. W. Long. 2. 38. Lat. 54. 45.

ABBOT, or **ABBAT**, the superior of a monastery of monks erected into an abbey or prelacy.

The name *Abbot* is originally Hebrew, where it signifies father. The Jews call *father*, in their language, *Ab*; whence the Chaldeans and Syrians formed *Abba*; thence the Greeks *Abbas*, which the Latins retained *Abbas*; and hence our *Abbot*, the French *Abbé*, &c. — St Mark and St Paul use the Syriac *Abba* in their Greek, by reason it was then commonly known in the synagogues and the primitive assemblies of the Christians; adding to it, by way of interpretation, the word *father*, *Abba o pater*, “*Abba, father*,” *q. d.* *Abba*, that is to say, *Father*. — But the name *Ab*, or *Abba*, which at first was a term of tenderness and affection in the Hebrew and Chaldee, became at length a title of dignity and honour: The Jewish doctors affected it; and one of their most ancient books, containing the sayings or apophthegms of divers of them, is intitled *Pirke Abboth*, or *Avoth*; *i. e.* *Chapters of the Fathers*. It was in allusion to this affectation, that Jesus Christ forbade his disciples to call any man their father on earth; which word St Jerome turns against the superiors of the monasteries of his time, for assuming the title of *Abbots* or fathers.

* See Monk and Archimandrite.

The name *Abbot*, then, appears as old as the institution of monks itself. — The governors of the primitive monasteries assumed indifferently the titles *Abbots*, and *Archimandrites* *. They were really distinguished from the clergy; though frequently confounded with them, because a degree above laymen.

In those early days, the abbots were subject to the bishops and the ordinary pastors. Their monasteries being remote from cities, built in the farthest solitudes, they had no share in ecclesiastical affairs. They went on Sundays to the parish-church with the rest of the people; or, if they were too remote, a priest was sent them to administer the sacraments; till at length they were allowed to have priests of their own body. The abbot or archimandrite himself was usually the priest: but his function extended no farther than to the spiritual assistance of his monastery; and he remained still in obedience to the bishop. There being among the abbots several persons of learning, they made a vigorous opposition to the rising heresies of those times; which first occasioned the bishops to call them out of their deserts, and fix them about the suburbs of cities, and at length in the cities themselves: from which æra their degeneracy is to be dated. The abbots, now, soon wore off their former plainness and simplicity, and began to be looked on as a sort of little prelates. They aspired at being independent of the bishops; and became so unsupportable, that some severe laws were made against them at the council of Chalcedon; this notwithstanding, in time many of them carried the point of independency, and got the appellation of *lord*, with other badges of the episcopate, particularly the mitre.

Hence arose new species of distinctions between the abbots. Those were termed *mitred abbots*, who were privileged to wear the mitre, and exercise episcopal authority within their respective precincts, being exempted from the jurisdiction of the bishop. Others were

called *croziered abbots*, from their bearing the crozier or pastoral staff. Others were styled *ecumenical* or universal abbots, in imitation of the patriarch of Constantinople: while others were termed *cardinal abbots*, from their superiority over all other abbots. — Among us, the mitred abbots were lords of parliament; and called *abbots-fovereign*, and *abbots-general*, to distinguish them from the other abbots. And as there were lords abbots, so there were also lords priors, who had exempt jurisdiction, and were likewise lords of Parliament. Some reckon 26 of these lords abbots and priors that sat in parliament. Sir Edward Coke says, that there were 27 parliamentary abbots and two priors. In the parliament 20 Rich. II. there were but 25 abbots and two priors: but in the summons to parliament anno 4 Ed. III. more are named.

At present, in the Roman-catholic countries, the principal distinctions observed between abbots are those of *regular* and *commendatory*. The former take the vow and wear the habit of their order; whereas the latter are seculars, though they are obliged by their bulls to take orders when of proper age.

Anciently the ceremony of creating an abbot consisted in clothing him with the habit called *cuculus*, or cowl; putting the pastoral staff into his hand, and the shoes called *pedales* on his feet; but at present, it is only a simple benediction, improperly called, by some, consecration.

ABBOT is also a title given to others beside the superiors of monasteries: thus bishops whose sees were formerly abbeys, are called abbots; as are the superiors of some congregations of regular canons, particularly that of St Genevieve at Paris: and among the Genoese, the chief magistrate of their republic formerly bore the title of *Abbot of the people*. It was likewise usual, about the time of Charlemagne, for several lords to assume the title of *count-abbots*, *abba-comites*; and that for no other reason, but because the superintendancy of certain abbeys was committed to them.

ABBOT (George), archbishop of Canterbury, was born Oct. 29. 1562, at Guildford in Surrey. He went through his studies at Oxford, and in 1597 was chosen principal of University College. In 1599, he was installed dean of Winchester: the year following, he was chosen vice-chancellor of the university of Oxford, and a second time in 1603. In 1604, that translation of the bible now in use was begun by the direction of king James; and Dr Abbot was the second of eight Divines of Oxford, to whom the care of translating the whole New Testament (excepting the epistles) was committed. The year following, he was a third time vice-chancellor. In 1608, he went to Scotland with George Hume Earl of Dunbar, to assist in establishing an union betwixt the kirk of Scotland and the church of England; and in this affair he behaved * with hist. of Pres- byterians, so much address and moderation, that it laid the foundation of all his future preferment. For king James ever after paid great deference to his advice and counsel; and upon the death of Dr Overton bishop of Litchfield and Coventry, he named Dr Abbot for his successor, who was accordingly constituted bishop of those two united sees in December 1609. About a month afterwards he was translated to the see of London, and on the second of November thereafter was raised to the archiepiscopal see.

Abbot.

It is not however improbable, that his extravagant adulation of his royal master, in which he went as far any other court-chaplain could do, contributed not a little to the acceleration of his preferment. In the preface to a pamphlet he published, the following specimen of ridiculous flattery occurs: Speaking of the king, he says, "whose life hath been so immaculate and unspotted, &c. that even malice itself, which leaves nothing unsearched, could never find true blemish in it, nor cast probable aspersion on it.—Zealous as a David; learned and wise, the *Solomon* of our age; religious as Josias; careful of spreading Christ's faith as Constantine the Great; just as Moses; undefiled in all his ways as a Jehosaphat and Hezekias; full of clemency as another Theodosius."—If Mr Walpole had seen this passage, he certainly would not have said, that "honest abbot could not flatter."

His great zeal for the Protestant religion made him a strenuous promoter of the match between the Elector Palatine and the Princess Elizabeth; which was accordingly concluded and solemnized the 14th of February 1612, the archbishop performing the ceremony on a stage erected in the royal chapel. In the following year happened the famous case of divorce betwixt the lady Francis Howard, daughter of the earl of Suffolk, and Robert earl of Effex: an affair which has been by many considered as one of the greatest blemishes of king James's reign; but the part acted therein by the archbishop added much to the reputation he had already acquired for incorruptible integrity. The matter was by the king referred to a court of delegates. The archbishop saw plainly, that his Majesty was very desirous the lady should be divorced; but he was, in his own judgment, directly against the divorce. He laboured all he could to extricate himself from this difficulty, by having an end put to the cause by some other way than by sentence; but it was to no purpose; for those who drove on this affair, had got too great power to be restrained from bringing it to the conclusion the king desired. The archbishop prepared a speech, which he intended to have spoken against the nullity of the marriage, in the court at Lambeth; but he did not make use of it, because the king ordered the opinions to be given in few words. He continued, however, inflexible in his opinion against the divorce; and drew up his reasons, which the king thought fit to answer himself. It need scarce be added, that sentence was given in the lady's favour. In 1618, the king published a declaration, which he ordered to be read in all churches, permitting sports and pastimes on the Lord's day: this gave great uneasiness to the archbishop; who, happening to be at Corydon when it came thither, had the courage to forbid its being read.

Being now in a declining state of health, the archbishop used in the summer to go to Hampshire for the sake of recreation; and being invited by lord Zouch to hunt in his park at Bramzill, he met there with the greatest misfortune that ever befel him; for he accidentally killed the game-keeper by an arrow from a cross-bow which he shot at one of the deer. This accident threw him into a deep melancholy; and he ever afterwards kept a monthly fast on

* Fuller's church hist. cent. xviii. p. 87.

Tuesday, the day on which this fatal mischance happened, and he settled an annuity of 20*l.* on the widow*. There were several persons who took an ad-

vantage of this misfortune, to lessen him in the king's favour; but his majesty said, "An angel might have miscarried in this sort." His enemies alleging that he had incurred an irregularity, and was thereby incapacitated for performing the offices of a primate; the king directed a commission to ten persons to inquire into this matter.

The result, however, was not satisfactory to his Grace's enemies; it being declared, that, as the murder was involuntary, he had not forfeited his archiepiscopal character. The archbishop thenceforward seldom assisted at the council, being chiefly hindered by his infirmities; but in the king's last illness he was sent for, and attended with great constancy till his Majesty expired on the 27th of March 1625. He performed the ceremony of the coronation of king Charles I. though very infirm and much troubled with the gout. He was never greatly in this king's favour, and the duke of Buckingham being his declared enemy, watched an opportunity of making him feel the weight of his displeasure. This he at last accomplished, upon the archbishop's refusing to license a sermon, preached by Dr Sibthorpe to justify a loan which the king had demanded, and pregnant with principles which tended to overthrow the constitution. The archbishop was immediately after suspended from all his functions as primate; and they were exercised by certain bishops commissioned by the king, of whom Laud, the archbishop's enemy, and afterwards his successor, was one: while the only cause assigned for this procedure was, That the archbishop could not at that time personally attend those services which were otherwise proper for his cognisance and direction. He did not, however, remain long in this situation; for a parliament being absolutely necessary, his Grace was sent for, and restored to his authority and jurisdiction. But not proving friendly to certain rigorous measures adopted by the prevailing church-party, headed by Laud, whose power and interest at court were now very considerable, his presence became unwelcome there; so that upon the birth of the Prince of Wales, afterwards Charles II. Laud had the honour to baptize him, as dean of the chapel. The archbishop being worn out with cares and infirmities, died at Corydon, the 5th of August 1633, aged 71 years; and was buried at Guildford, the place of his nativity, and where he had endowed an hospital with lands to the amount of 300*l.* per annum. A stately monument was erected over the grave, with the effigy of the archbishop in his robes.

He showed himself, in most circumstances of his life, a man of great moderation to all parties; and was desirous that the clergy should attract the esteem of the laity by the sanctity of their manners, rather than claim it as due to their function. His notions and principles, however, not suiting the humour of some writers, have drawn upon him many severe reflections; particularly, which is to be regretted, from the earl of Clarendon. But Dr Welwood has done more justice to his merit and abilities*. He wrote several tracts upon various subjects; and, as already mentioned, translated part of 8vo, 1700, the New Testament, with the rest of the Oxford divines, 1611. P. 38.

It is proper to observe here, that there was another writer of both his names, who flourished somewhat later. This George Abbot wrote *A Paraphrase on Job*,

Abbot.

Abbot *Job, A vindication of the sabbath, and A paraphrase on the Psalms.*

Abbotsbury

ABBOT (Robert), elder brother to the former, and born at Guilford in 1560, went through his studies in Baliol college, Oxford. In 1582, he took his degree of master of arts, and soon became a celebrated preacher; and to this talent he chiefly owed his preferment. Upon his first sermon at Worcester, he was chosen lecturer in that city, and soon after rector of All-saints in the same place. John Stanhope, Esq; happening to hear him preach at Paul's-cross, was so pleased with him, that he immediately presented him to the rich living of Bingham in Nottinghamshire. In 1597, he took his degree of doctor in divinity: and, in the beginning of King James's reign, was appointed chaplain in ordinary to his Majesty; who had such an opinion of him as a writer, that he ordered the doctor's book *De Antichristo* to be printed with his own commentary upon part of the Apocalypse. In 1609, he was elected master of Baliol college; which trust he discharged with the utmost care and assiduity, by his frequent lectures to the scholars, by his continual presence at public exercises, and by promoting temperance in the society. In November 1610, he was made prebendary of Normanton in the church of Southwell; and, in 1612, his Majesty appointed him regius professor of divinity at Oxford. The fame of his lectures became very great; and those which he gave upon the supreme power of kings against Bellarmine and Suarez, so much pleased his Majesty, that when the see of Salisbury became vacant, he named him to that bishopric, and he was consecrated by his own brother at Lambeth, December 3. 1615. When he came to Salisbury, he found the cathedral running to decay, through the negligence and covetousness of the clergy belonging to it; however, he found means to draw five hundred pounds from the prebendaries, which he applied to the reparation of this church. He then gave himself up to the duties of his function with great diligence and assiduity, visiting his whole diocese in person, and preaching every Sunday whilst health would permit. But this was not long: for his sedentary life, and close application to study, brought upon him the gravel and stone; of which he died on the 2d of March 1618, in the fifty-eighth year of his age; having not filled the see quite two years and three months, and being one of the five bishops which Salisbury had in six years. He was buried opposite to the bishop's seat in the cathedral. Dr Fuller*, speaking of the two brothers, says, "that George was the more plausible preacher, Robert the greatest scholar; George the abler statesman, Robert the deeper divine; gravity did frown in George, and smile in Robert." He published several pieces; he also left behind him sundry manuscripts, which Dr Corbet made a present of to the Bodleian library.

* *Worthies of England in Surrey.*

ABBOTSBROMLEY, a town in Staffordshire, with a market on Tuesday. After the dissolution of the monasteries, it was given to the Lord Paget; and has since been called *Paget's Bromley*, and is so denominated in the county map. But it retains its old name in the King's books, and is a discharged vicarage of 30 l. clear yearly value. It likewise retains the old name with regard to the fairs. W. Long. 1. 2. Lat. 52. 45.

ABBOTSBURY, a small town in Dorsetshire, with

a market on Thursday. W. Long. 1. 17. Lat. 50. 40. Abbreviate The abbey near this town was founded by a Norman lady, about the year 1026; and Edward the Confessor and William the Conqueror were considerable benefactors to it.

Abdalmalek.

ABBREVIATE of ADJUDICATIONS, in Scots law, an abstract or abridgment of a decret of adjudication, which is recorded in a register kept for that purpose.

ABBREVIATION, or ABBREVIATURE, a contraction of a word or passage; made by dropping some of the letters, or by substituting certain marks or characters in their place.—Lawyers, physicians, &c. use abundance of abbreviations, partly for the sake of expedition, and partly for that of mystery; but of all people the Rabbins are the most remarkable for this practice, so that their writings are unintelligible without the Hebrew abbreviations. The Jewish authors and copyists do not content themselves with abbreviating words like the Greeks and Latins, by retrenching some of the letters or syllables; they frequently take away all but the initial letters. They even frequently take the initials of several succeeding words, join them together, and, adding vowels to them, make a sort of barbarous word, representative of all those which they have thus abridged. Thus, Rabbi Moses ben Maimon, in their abbreviation is *Rambam*, &c.

ABBREVIATOR, in a general sense, a person who abridges any large book into a narrower compass.

ABBREVIATORS, a college of 72 persons in the chancery of Rome, who draw up the pope's briefs, and reduce petitions, when granted by him, into proper form for being converted into bulls.

ABBUTALS, signify the buttings or boundings of land towards any point. Limits were anciently distinguished by artificial hillocks, which were called *bote-mines*; and hence *butting*. In a description of the site of land, the sides on the breadth are more properly *adjacentes*, and those terminating the length are *abbutantes*; which, in old surveys, were sometimes expressed by *capitare*, to head, whence abbutals are now called *head lands*.

ABCEDARY, or ABCEDANIAN, an epithet given to compositions, the parts of which are disposed in the order of the letters of the alphabet: thus we say, *Abcedarian psalms, lamentations, hymns, &c.*

ABCOURT, a town near St Germans, four leagues from Paris. Here is a brisk chalybeate water, impregnated with fixed air and the fossil alkali; and resembling the water of Spa and Ilmington.

ABDALLA, the son of Abdalmothleb, was the father of the prophet Mahomet. Several other Arabians of eminence bore the same name.

ABDALMALEK, the son of Mirvan, and the 5th khalif of the race of the Omniades, surnamed *Rasch al Hegianat*, i. e. the skinner of a stone, because of his extreme avarice; as also *Aboulzebah*, because his breath was said to be so poisonous as to kill all the flies which rested on his face. Yet he surpassed all his predecessors in power and dominion; for in his reign the Indies were conquered in the east, and his armies penetrated Spain in the west: he likewise extended his empire toward the south, by making himself master of Medina and Mecca. He began his reign in the 65th of the hegira, A. D. 648; reigned 15 years; and four of his sons enjoyed the khalifate one after another.

Abdalmalek
||
Abdera.

ABDALMALEK (Ben Zohar), an eminent physician, commonly called by the Europeans *Avenzoar*. See AVENZOAR.

ABDALMOTHLEB, or ABDAL MATELEB, the son of Hashem, the father of Abdalla, and grandfather of Mahomet the prophet of the Mussulmans, was, it is said, of such wonderful comeliness and beauty, that all women who saw him became enamoured: which may have given occasion to that prophetic light, which, according to the Arabians, shone on the forehead of him, his ancestors, and descendants; it being certain that they were very handsome and graceful men. He died when Mahomet, of whom he had taken peculiar care, was only 8 or 9 years old; aged, according to some, 110, and according to other writers 120.

ABDALONYMUS, or ABDOLONYMUS (in classic history), of the royal family of Sidon, and descended from King Cinyras, was contented to live in obscurity, and get his subsistence by cultivating a garden, while Strato was in possession of the crown of Sidon. Alexander the Great having deposed Strato, inquired whether any of the race of Cinyras was living, that he might set him on the throne. It was generally thought that the whole race was extinct: but at last Abdalonymus was thought of, and mentioned to Alexander; who immediately ordered some of his soldiers to fetch him. They found the good man at work, happy in his poverty, and entirely a stranger to the noise of arms, with which all Asia was at that time disturbed; and they could scarcely persuade him they were in earnest. Alexander was convinced of his high descent by the dignity that appeared in his person; but was desirous of learning from him in what manner he bore his poverty. "I wish," said Abdalonymus, "I may bear my new condition as well: These hands have supplied my necessities: I have had nothing, and I have wanted nothing." This answer pleased Alexander so much, that, besides giving him all that was Strato's, he augmented his dominions, and gave him a large present out of the Persian spoils.

ABDALS, in the Eastern countries a kind of saints supposed to be inspired to a degree of madness. The word comes, perhaps, from the Arabic, *Abdallah*, the servant of God. The Persians call them *devaneh khoda*, similar to the Latins way of speaking of their prophets and sibyls, *q. d. furentes deo*, raging with the god. They are often carried by excess of zeal, especially in the Indies, to run about the streets, and kill all they meet of a different religion; of which travellers furnish many instances. The English call this, *running a muk*, from the name of the instrument, a sort of poniard, which they employ on those desperate occasions. If they are killed, as it commonly happens, before they have done much mischief, they reckon it highly meritorious; and are esteemed, by the vulgar, martyrs for their faith.

ABDARA, or ABDERA, (anc. geog.), a town of Boeotia in Spain, a Phœnician colony; now *Adra*, to the west of Almeira in the kingdom of Granada.

ABDERA, (anc. geog.) a maritime town of Thrace, not far from the mouth of the river Nessus, on the east side. The foundation, according to Herodotus, was attempted to be laid by Timeus the Clazomenian; but he was forced by the Thracians to quit the design. The Teians undertook it, and succeeded; set-

ting there, in order to avoid the insults of the Persians. —Several singularities are told of Abdera*. The grass of the country round it was so strong, that such horses as eat of it ran mad. In the reign of Cassander king of Macedon, this city was so pestered with frogs and rats, that the inhabitants were forced to quit it for a time. —The Abderites, or Abderitani, were very much derided for their want of wit and judgment: yet their city has given birth to several eminent persons; as Protagoras, Democritus, Anaxarchus, Hecataeus the historian, Nicenæus the poet, and many others, who were mentioned among the illustrious men. —In the reign of Lyfimachus, Abdera was afflicted for some months with a most extraordinary disease†: this was a burning fever, whose crisis was always on the seventh day, and then it left them; but it so distracted their imaginations, that they fancied themselves players. After this, they were ever repeating verses from some tragedy, and particularly out of the *Andromeda* of Euripides, as if they had been upon the stage; so that many of these pale, meagre actors, were pouring forth their tragic exclamations in every street. This delirium continued till the winter following; which was a very cold one, and therefore fitter to remove it. Lucian, who has described this disease, endeavours to account for it in this manner: Archelaus, an excellent player, acted the *Andromeda* of Euripides before the Abderites, in the height of a very hot summer. Several had a fever at their coming out of the theatre; and as their imaginations were full of the tragedy, the delirium which the fever raised represented perpetually *Andromeda*, *Perseus*, *Medusa*, &c. and the several dramatic incidents, and called up the ideas of those objects, and the pleasure of the representation, so strongly, that they could not forbear imitating Archelaus's action and declamation: And from these the fever spread to others by infection.

ABDERAHMA, a Saracen viceroy in Spain, who revolted and formed an independent principality at Cordova. He had several successors of the same name.

ABDEST, a Persian word, properly signifying the water placed in a basin for washing the hands; but is used to imply the legal purifications practised by the Mahometans before they enter on their religious ceremonies.

ABDIAS OF BABYLON, one of the boldest legend-writers, who boasted he had seen our Saviour, that he was one of the 72 disciples, had been eye-witness of the actions and prayers at the deaths of several of the apostles, and had followed into Persia St Simon and St Jude, who, he said, made him the first bishop of Babylon. His book intitled *Historia certaminis apostolici*, was published by Wolfgang Lazius, at Basil, 1551; and it has since borne several impressions in different places.

ABDICATION, the action whereby a magistrate, or person in office, renounces and gives up the same before the term of service is expired.

This word is frequently confounded with *resignation*; but differs from it, in that abdication is done purely and simply, whereas resignation is in favour of some third person. It is said to be a renunciation, quitting, and relinquishing, so as to have nothing further to do with a thing; or the doing of such actions as are inconsistent with the holding of it. On King James's leaving the kingdom, and abdicating the government, the lords

Abdera
||
Abdication.
Plinii,
lib. xxv. c. 8.
Just. lib. xv.
c. 2.
Lucianus,
quomodo Hist.
sit conscriben-
dus initio.

Abdomen || lords would have had the word *desertion* made use of; but the commons thought it was not comprehensive enough, for that the king might then have liberty of returning. — Among the Roman writers it is more particularly used for the act whereby a father disclaimed or disclaimed his son, and expelled him the family. It is distinguished from *exheredatio* or *disinheriting*, in that the former was done in the father's lifetime; the latter, by will at his death: so that whoever was abdicated, was also disinherited; but not *vice versa*.

ABDOMEN, in anatomy, is that part of the trunk of the body which lies between the thorax and the bottom of the pelvis. See **ANATOMY**.

ABDOMINALES, or **ABDOMINAL FISHES**, constitute the IVth Order of the *Fourth Class* of Animals, in the Linnæan system. See **ZOOLOGY**.

ABDUCTION, in logic, a kind of argumentation, by the Greeks called *apagoge*, wherein the greater extreme is evidently contained in the medium, but the medium not so evidently in the lesser extreme as not to require some farther medium or proof to make it appear. It is called *abduction*, because, from the conclusion, it draws us on to prove the proposition assumed. Thus, in the syllogism, "All whom God absolves are free from sin; but God absolves all who are in Christ; therefore all who are in Christ are free from sin," — the major is evident; but the minor, or assumption, is not so evident without some other proposition to prove it, as, "God received full satisfaction for sin by the sufferings of Jesus Christ."

ABDUCTION, in surgery, a species of fracture, wherein the broken parts of the bone recede from each other.

ABDUCTOR, or **ABDUCTENT**, in anatomy, a name given to several of the muscles, on account of their serving to withdraw, open, or pull back the parts to which they belong.

ABEL, second son of Adam and Eve, was a shepherd. He offered to God some of the firstlings of his flock, at the same time that his brother Cain offered the fruits of the earth. God was pleased with Abel's oblation, but displeased with Cain's; which so exasperated the latter, that he rose up against his brother and killed him. These are the only circumstances Moses relates of him; though, were we to take notice of the several particulars to which curiosity has given birth on this occasion, they would run to a very great length. But this will not be expected. It is remarkable, that the Greek churches, who celebrate the feasts of every other patriarch and prophet, have not done the same honour to Abel. His name is not to be found in any catalogue of saints or martyrs till the 10th century; nor even in the new Roman martyrology. However he is prayed to, with some other saints, in several Roman litanies said for persons who lie at the point of death.

ABEL Kéranim, or **Vincarum**, beyond Jordan, in the county of the Ammonites, where Jephthah defeated them, seven miles distant from Philadelphia, abounding in vines, and hence the name. It was also called *Abela*.

ABEL-Mehola, the country of the prophet Elisha, situate on this side Jordan, between the valley of Jezreel and the village Bethmaela in the plains of Jordan, where the Midianites were defeated by Gideon. Judges, vii. 22.

ABEL-Mizraim, called also the Threshing-floor of Atad; signifying the lamentation of the Egyptians; in allusion to the mourning for Jacob. Gen. i. 3, 10, 11. Supposed to be near Hebron.

ABEL-Mosch, or *Abelmusch*, in botany, the trivial name of a species of the **HIBISCUS**.

ABEL-Sattim, or *Sittim*, a town in the plains of Moab, to the N. E. of the Dead Sea, not far from Jordan, where the Israelites committed fornication with the daughters of Moab: So called, probably, from the great number of sittim-trees there.

ABELARD (Peter), one of the most famous doctors of the twelfth century, was born at Palais near Nantz, in Britany: he was well learned in divinity, philosophy, and the languages; but was particularly distinguished by his skill in logic, and his fondness for disputations, which led him to travel into several provinces in order to give public proof of his acuteness in that science.

After having baffled many antagonists, he read lectures in divinity with great applause at Paris, where he boarded with a canon whose name was *Fulbert*, and who had a very beautiful niece named *Heloise*. The canon ardently wished to see this young lady make a figure among the learned, and Abelard was made her preceptor: but, instead of instructing her in the sciences, he taught her to love. Abelard now performed his public functions very coldly, and wrote nothing but amorous verses. *Heloise* proving with child, Abelard sent her to a sister of his in Britany, where she was delivered of a son. To soften the canon's anger, he offered to marry *Heloise* privately; and the old man was better pleased with the proposal than the niece; who, from a singular excess of passion, chose to be Abelard's mistress rather than his wife. She married, however; but used often to protest upon oath that she was single, which provoked the canon to use her ill. Upon this, Abelard sent her to the monastery of Argenteuil; where she put on a religious habit, but did not take the veil. *Heloise's* relations considering this as a second treachery, hired ruffians, who, forcing into his chamber in the dead of the night, emasculated him. This infamous treatment made him fly to the gloom of a cloister. He assumed the monastic habit in the abbey of St Dennis; but the disorders of that house soon drove him from thence. He was afterwards charged with heresy; but after several persecutions for his religious sentiments, he settled in a solitude in the diocese of Troies, where he built an oratory, to which he gave the name of the *Paraclet*. He was afterwards chosen superior of the abbey of Ruis in the diocese of Vannes: when the nuns being expelled from the nunnery in which *Heloise* had been placed, he gave her his oratory; where she settled with some of her sister nuns, and became their prioress.

Abelard mixed the philosophy of Aristotle with his divinity, and in 1140 was condemned by the council of Rheims and Sens. Pope Innocent II. ordered him to be imprisoned, his books to be burnt, and forbid him ever teaching again. However, he was soon after pardoned, at the solicitation of Peter the Venerable, who received him into his abbey of Clugni, where he led an exemplary life. He died in the priory of Marcellus at Châlons, April 21, 1142, aged sixty-three. His corpse was sent to *Heloise*, who buried it in the *Paraclet*. He left several works: the most celebrated of which

are

Abel tree are those tender letters that passed between him and Heloise, with the account of their misfortunes prefixed; which have been translated into English, and immortalised by the harmony of Mr Pope's numbers.

ABEL-TREE, or ABELE-TREE, an obsolete name for a species of the poplar. See POPULUS.

ABELIANS, ABEOLITES, or ABELONIANS, in church history, a sect of heretics mentioned by St Austin, which arose in the diocese of Hippo in Africa, and is supposed to have begun in the reign of Arcadius, and ended in that of Theodosius. Indeed it was not calculated for being of any long continuance. Those of this sect regulated marriage after the example of Abel; who, they pretended, was married, but died without ever having known his wife. They therefore allowed each man to marry one woman, but enjoined them to live in continence: and, to keep up the sect, when a man and woman entered into this society, they adopted a boy and a girl, who were to inherit their goods, and to marry upon the same terms of not begetting children, but of adopting two of different sexes.

ABELLA, anciently a town of Campania, near the river Clanius. The inhabitants were called Abellani, and said to have been a colony of Chalcidians. The nux Avellana, called also *Prænestina*, or the *hazelnut*, takes its name from this town, according to Macrobius. Now *Avella*.

ABELLINUM, anciently a town of the Hirpini, a people of Apulia; distant about a mile from the rivulet Sabato, between Beneventum and Salernum. Pliny calls the inhabitants *Abellinates*, with the epithet *Protopi*, to distinguish them from the Abellinates Marfi. Now *Avellino*. E. Long. 15. 20. Lat. 21.

ABEN EZRA (Abraham), a celebrated rabbi, born at Toledo in Spain, called by the Jews, The wise, great, and admirable Doctor, was a very able interpreter of the Holy Scriptures; and was well skilled in grammar, poetry, philosophy, astronomy, and medicine. He was also a perfect master of the Arabic. His principal work is, Commentaries on the Old Testament, which is much esteemed: these are printed in Bomberg's and Buxtorf's Hebrew Bibles. His style is clear, elegant, concise, and much like that of the Holy Scriptures: he almost always adheres to the literal sense, and every where gives proofs of his genius and good sense: he, however, advances some erroneous sentiments. The scarcest of all his books is intitled *Jesud Mora*; which is a theological work, intended as an exhortation to the study of the Talmud. He died in 1174, aged 75.

ABEN Meller, a learned rabbin, who wrote a commentary on the Old Testament in Hebrew, intitled *The Perfection of Beauty*. This rabbin generally follows the grammatical sense and the opinions of Kimchi. The best edition is that of Holland.

ABENAS, a town of France, in Languedoc and in the Lower Vivarais, seated on the river Ardech, at the foot of the Cevennes. E. Long. 4. 43. Lat. 44. 40.

ABENEL GAUBY, a fixed star of the second or third magnitude, on the south scale of the constellation LIBRA.

ABENSPERG, a small town of Germany, in the circle and duchy of Bavaria, and in the government of Munich. It is seated on the river Abentz, near the Danube. E. Long. 11. 38. Lat. 48. 45.

ABERAVON, a borough-town of Glamorganshire in Wales, governed by a portreeve. It had a market, which is now discontinued. The vicarage is discharged, and is worth 45 l. clear yearly value. It is seated at the mouth of the river Avon, 194 miles west of London. W. Long. 3. 21. Lat. 51. 40.

ABERBROTHICK, or ARBROATH, one of the royal boroughs of Scotland, situated in the county of Angus, about 40 miles N. N. E. of Edinburgh; its W. Long. being 2. 29. and N. Lat. 56. 36. It is seated on the discharge of the little river Brothie into the sea, as the name imports, *Aber* in the British implying such a situation. It is a small but flourishing place, well built, and still increasing. The town has been in an improving state for the forty last years, and the number of inhabitants greatly augmented; which is owing to the introduction of manufactures. The number at this time is said to be about four thousand: these principally consist of weavers of coarse brown linens, and some sail-cloth; others are employed in making white and coloured threads: the remainder are either engaged in the shipping of the place, or in the necessary and common mechanic trades. The brown linens, or Osnaburghs, were manufactured here before any encouragement was given by government, or the linen company erected at Edinburgh. It appears from the books of the stamp-office in this town, that seven or eight hundred thousand yards are annually made in the place, and a small district round. Besides this export and that of thread, much barley and some wheat is sent abroad. The foreign imports are flax, flax-seed, and timber, from the Baltic. The coasting trade consists of coals from Borrowstounness, and lime from Lord Elgin's kilns in Fife.—At this place, in default of a natural harbour, a tolerable artificial one of piers has been formed, where, at spring-tides, which rise here fifteen feet, ships of two hundred tons can come, and of eighty at neap-tides; but they must lie dry at low water. This port is of great antiquity: there is an agreement yet extant between the abbot and the burghers of Aberbrothick, in 1194, concerning the making of the harbour. Both parties were bound to contribute their proportions; but the largest fell to the share of the former, for which he was to receive an annual tax payable out of every rood of land lying within the borough.—The glory of this place was the abbey, whose very ruins give some idea of its former magnificence. It was founded by William the Lion in 1178, and dedicated to our celebrated primate Thomas à Becket. The founder was buried here; but there are no remains of his tomb, or of any other, excepting that of a monk of the name of Alexander Nicol. The monks were of the Tyro-nensian order; and were first brought from Kelso, whose abbot declared those of this place, on the first institution, to be free from his jurisdiction. The last abbot was the famous Cardinal Beaton, at the same time archbishop of St Andrew's, and, before his death, as great and absolute here as Wolsey was in England. King John, the English monarch, granted this monastery most uncommon privileges; for, by charter under his great seal, he exempted it *a telonij et consuetudine* in every part of England, except London. At Aberbrothick is a chalybeate water, similar to those of Peterhead and Glendy.

ABERCONWAY,

Abercon-
way,
Aberdeen.

ABERCONWAY, or **CONWAY**, Caernarvonshire, North-Wales; so called from its situation at the mouth of the river Conway. It is a handsome town, pleasantly situated on the side of a hill, and has many conveniences for trade; notwithstanding which it is the poorest town in the county. It was built by Edward I. and had not only walls, but a strong castle which is now in ruins. Here is an inscription on the tomb of one Nicholas Hooks, importing that he was the one-and-fortieth child of his father, and had twenty-seven children himself. It is 229 miles from London. W. Long. 3. 47. N. Lat. 53. 20.

ABERDEEN, the name of two cities in Scotland, called the *Old* and *New Town*, situated on the German Ocean, in W. Long. 1. 40. and N. Lat. 57. 19.

Aberdeen is a place of great antiquity. According to tradition, it was of note in the reign of Gregory, who conferred on it some privileges about the year 893. In 1004, Malcolm II. founded a bishopric at a place called Mortlich in Banffshire, in memory of a signal victory which he there gained over the Danes: which bishopric was translated to Old Aberdeen by David I.; and in 1163, the then bishop of Aberdeen obtained a new charter from Malcolm IV. There is extant a charter of Alexander II. by which, in 1217, the King grants to Aberdeen the same privileges he had granted to his town of Perth.

The Old Town lies about a mile to the north of the New, at the mouth of the river Don, over which is a fine Gothic bridge, of a single arch, greatly admired, which rests at both sides on two rocks. This arch, said to have been built by a bishop of Aberdeen about the year 1290, is 67 feet wide at the bottom, and 34½ feet high above the surface of the river, which at ebb-tide is here 19 feet deep. The Old Town was formerly the seat of the bishop, and had a large cathedral commonly called *St Machar's*. Two very antique spires, and one aisle, which is used as a church, are now the only remains of it. The bishopric was founded in the time of David I. as above mentioned. The cathedral had anciently two rows of stone pillars across the church, and three turrets; the steeple, which was the largest of these turrets, rested upon an arch, supported by four pillars. In this cathedral there was a fine library; but, about the year 1560, it was almost totally destroyed. But the capital building is the King's-college on the south side of the town, which is a large and stately fabric. It is built round a square, with cloisters on the south side. The chapel is very ruinous within; but there still remains some wood-work of exquisite workmanship. This was preserved by the spirit of the principal at the time of the reformation, who armed his people and checked the blind zeal of the barons of the Mearns; who, after stripping the cathedral of its roof, and robbing it of the bells, were going to violate this seat of learning. They shipped their sacrilegious booty, with an intention of exposing it to sale in Holland: but the vessel had scarcely gone out of port, when it perished in a storm with all its ill-gained lading. The steeple is vaulted with a double cross arch; above which is an imperial crown, supported by eight stone pillars, and closed with a globe and two gilded crosses. In the year 1631 this steeple was thrown down by a storm, but was soon after rebuilt in a more stately form. This college was founded in

1494, by William Elphinston bishop of this place, lord chancellor of Scotland in the reign of James III. and lord privy seal in that of James IV. But James IV. claimed the patronage of it, and it has since been called the *King's College*. This college, and the Marischal-college in the New Town, form one university, called the *University of King Charles*. The library is large, but not remarkable for many curiosities. Hector Boethius was the first principal of the college; and sent for from Paris for that purpose, on an annual salary of forty merks Scots, at thirteen pence each. The square tower on the side of the college was built by contributions from General Monk and the officers under him then quartered at Aberdeen, for the reception of students; of which there are about a hundred belonging to the college who lie in it.

The New Town is the capital of the shire of Aberdeen. For largeness, trade, and beauty, it greatly exceeds any town in the north of Scotland. It is built on a hill or rising ground, and lies on a small bay formed by the Dee, deep enough for a ship of 200 tons, and above two miles in circumference. The buildings (which are of granite from the neighbouring quarries) are generally four stories high; and have, for the most part, gardens behind them, which gives it a beautiful appearance. On the high street is a large church which formerly belonged to the Franciscans. This church was begun by Bishop William Elphinston; and finished by Gavinus Dunbar, bishop of Aberdeen, about the 1500. Bishop Dunbar is said likewise to have built the bridge over the Dee, which consists of seven arches. In the middle of Castle-street is an octagon building, with neat bas-relievs of the kings of Scotland from James I. to James VII. The town-house makes a good figure, and has a handsome spire in the centre. The grammar-school is a low but neat building. Gordon's hospital is handsome; in front is a good statue of the founder: it maintains forty boys, who are apprenticed at proper ages. The infirmary is a large plain building, and sends out between eight and nine hundred cured patients annually. But the chief public building in the New Town is the Marischal-college, founded by George Keith Earl of Marischal, in the year 1593, but since greatly augmented with additional buildings. There are about 140 students belonging to it. In both the Marischal and King's college the languages, mathematics, natural philosophy, divinity, &c. are taught by very able professors. The convents in Aberdeen were: One of Mathurines, or of the order of the Trinity, founded by William the Lion, who died in 1214; another of Dominicans, by Alexander II.; a third of Observantines, a building of great length in the middle of the city, founded by the citizens and Mr Richard Vans, &c.; and a fourth of Carmelites, or White Friars, founded by Philip de Arbuthnot in 1350.

Aberdeen, including the Old Town, is supposed to contain 25,000 people. Its trade is considerable, but might be greatly extended by an attention to the white fisheries.

The harbour was long a great detriment to its trade, and occasioned the loss of many lives and much property. A stranger could never depend upon finding it as he left it; while vessels lay at anchor in the road till the tide should make, they have often been wrecked by storms.

Aberdeen.

Aberdeen. storms which suddenly arose. It was very narrow at the mouth, having the easterly rocky point of the Grampian mountains on the south, and a flat blowing sand on the north, extending along the coast for many miles. By the easterly and north-east storms the sand was driven in a long ridge across the harbour's mouth, and formed what was called the *bar*. Upon this bar the depth of water at low tide was sometimes not above three feet. Clearing away the sand, though but a partial and temporary remedy, was a matter of great expence to the community. If it was cleared one week so as to have five or six feet of water at ebb, a fresh storm the next week undid all that had been done. The town at last came to the resolution of erecting a strong pier on the north side of the harbour. This pier is 1200 feet in length, and gradually increases in thickness and height as it approaches to the sea, where the head or rounding is 60 feet diameter at the base, and the perpendicular elevation is 38 feet. The whole is built of granite, the most durable stone known: many of the outside stones are above three tons weight, with hewn beds. It was built under the direction of Mr Smeaton; and the expence, amounting to above 17,000 l. is defrayed by doubling the harbour-dues, which are chiefly paid by the inhabitants.

A little to the south of the bar, they have now a depth of 17 fathoms at low water; and at the harbour mouth, from eight to nine fathoms, where they had formerly but a few feet.

Aberdeen once enjoyed a good share of the tobacco trade. At present, its imports are from the Baltic, and a few merchants trade to the West Indies and North America. Its exports are stockings, thread, salmon, and oatmeal. The first is a most important article, as appears by the following state of it. For this manufacture, 20,800 pounds worth of wool is annually imported, and 1600 pounds worth of oil. Of this wool are annually made 69,333 dozen pairs of stockings; worth, at an average, 11. 10s. per dozen. These are the work of the country-people in almost all parts of this great county, who get 4s. per dozen for spinning, and 14s. per dozen for knitting; so that there is annually paid them 62,329 l. 14s. There is, besides, about 2000 l. value of stockings manufactured from the wool of the county. The thread manufacture is another considerable article, though trifling in comparison of the woollen. The salmon fisheries on the Dee and the Don are a good branch of trade. About 46 boats, and 130 men, are employed on the first; and, in some years, 167,000 lb. of fish have been sent pickled to London, and about 930 barrels of salted fish exported to France, Italy, &c.—The fishery on the Don is far less considerable. The fish of this river are taken in cruives above the bridge; a practice contrary to the ancient laws of the kingdom, unless where the nature of the water rendered the net-fishery impracticable. The inhabitants likewise export considerable quantities of pickled pork, which they sell to the Dutch for victualling their East India ships and men of war; the Aberdeen pork having the reputation of being the best cured of any in Europe for keeping on long voyages.

“It is however remarkable, (Mr Knox observes), that there is not a single decked vessel fitted out from Aberdeen for the herring or white fisheries: here is now
N^o 1.

an excellent harbour; an active people, conversant in Aberdeen-trade, and possessed of capital; seated within six hours sailing of Long Fortys, and two days sailing of the Shetland Isles. This inattention is the more extraordinary, as the exports of Aberdeen, though very considerable, do not balance the imports in value. The herring and white fisheries, therefore, if prosecuted with vigour, cured and dried with judgment, would not only extend the scale of exports, but also furnish the outward bound vessels with freights, and better assortments for the foreign markets. The salmon of the Dee and Don are taken in great abundance, cured in the highest perfection, and greatly valued at the European markets. If the merchants, in addition to these, should also export the cargoes of 50 or 60 vessels constantly employed in the herring and white fisheries, the port of Aberdeen would in a few years become the most celebrated mart of fish now existing.”

From a round hill at the west end of the city, flow two springs, one of pure water, and the other of a quality resembling the German Spa. Aberdeen, with Aberbrothick, Brechin, Montrose, and Inverbervie, returns one member to parliament.

ABERDEENSHIRE, comprehends the districts of Mar, Garioch, Strathbogie, and the greater part of Buchan; and sends one member to parliament. It is washed on the east and north by the ocean; and abounds in sea-ports. From whence there is a safe and ready passage to the Orkneys and Shetland Isles, the Greenland fisheries, Norway, and the regions round the Baltic, the German coast, Holland, Flanders, France. It is watered by numerous streams, all of them the resort of salmon, and whose banks display the most extensive plantations as well as natural woods in Britain.

ABERDOUR, a small town in Fifeshire, Scotland, on the frith of Forth, about ten miles N. W. of Edinburgh. In old times it belonged to the Viponts; in 1126 it was transferred to the Mortimers by marriage, and afterwards to the Douglasses. William, lord of Liddesdale, surnamed the *Flower of Chivalry*, in the reign of David II. by charter conveyed it to James Douglas, ancestor of the present noble owner the earl of Morton. The monks of Inchcolm had a grant for a burial-place here from Allan de Mortimer, in the reign of Alexander III. The nuns, usually styled the poor *Clares*, had a convent at this place.

ABERFORD, a market-town in the west riding of Yorkshire, stands in a bottom; and is about a mile long, and indifferently well built. It is near a Roman road, which is raised very high, and not far from the river Cock; between which and the town there is the foundation of an old castle still visible. It is 181 miles north-by-west from London. W. Long. 2. 45. Lat. 55. 52.

ABERGAVENNY, a large, populous, and flourishing town in Monmouthshire, seated at the confluence of the rivers Usk and Gavenny. It has a fine bridge over the Usk, consisting of fifteen arches; and being a great thoroughfare from the west part of Wales to Bath, Bristol, Gloucester, and other places, is well furnished with accommodations for travellers. It is surrounded with a wall, and had once a castle. It carries on a considerable trade in flannels, which are brought hither for sale from the other parts of the county.

Abernethy, county. It is 142 miles distant from London. W. Long. 2. 45. Lat. 51. 50. **Abergavenny** appears to have been the *Gibbanium* of Antoninus, and the town of Usk his *Burrium*.

ABERNETHY (John), an eminent dissenting minister, was the son of Mr John Abernethy a dissenting minister in Colrairie, and was born on the 19th of October 1680. When about nine years of age, he was separated from his parents, his father being obliged to attend some public affairs in London; and his mother, to shelter herself from the mad fury of the Irish rebels, retiring to Derry, a relation who had him under his care, having no opportunity of conveying him to her, took him with him to Scotland; by which means he escaped the hardships he must have suffered at the siege of Derry, where Mrs Abernethy lost all her other children. He afterwards studied at the university of Glasgow, till he took the degree of master of arts; and, in 1708, he was chosen minister of a dissenting congregation at Antrim, where he continued above 20 years. About the time of the Bangorian controversy (for which see **HOADLEY**), a dissension arose among his brethren in the ministry at Belfast, on the subject of subscription to the Westminster confession; in which he became a leader on the negative side, and incurred the censure of a general synod. Being in consequence deserted by the greatest part of his congregation, he accepted an invitation to settle in Dublin, where his preaching was much admired. He was distinguished by his candid, free, and generous sentiments; and died of the gout in Dec. 1740, in the 60th year of his age. He published a volume of sermons on the Divine Attributes; after his death a second volume was published by his friends; and these were succeeded by four other volumes on different subjects: all of which have been greatly admired.

ABERNETHY, a town in Strathern, a district of Perthshire in Scotland. It is seated on the river Tay, a little above the mouth of the Erne. It is said to have been the seat of the Pictish kings; and was afterwards the see of an archbishop, since transferred to St Andrew's. It is now greatly decayed.

ABERRATION, in astronomy, a small apparent motion of the fixed stars discovered by the late Dr Bradley. The discovery was made by accident in the year 1725, when Mr Molyneux and Dr Bradley began to observe the bright star in the head of *Draco*, marked γ by Bayer, as it passed near the zenith, with an instrument made by Mr Graham, in order to discover the parallax of the earth's annual orbit; and, after repeated observations, they found this star, about the beginning of March 1726, to be 20" more southerly than at the time of the first observation. It now indeed seemed to have arrived at its utmost limit southward; because, in several trials made about this time, no sensible difference was observed in its situation. By the middle of April, it appeared to be returning back again toward the north; and, about the beginning of June, it passed at the same distance from the zenith as it had done in December, when it was first observed: in September following, it appeared 39" more northerly than it was in March, just the contrary way to what it ought to appear by the annual parallax of the stars. This unexpected phenomenon perplexed the observers very much; and Mr Molyneux died before the true cause of it was

discovered. After this, Dr Bradley, with another instrument more exact and accurately adapted to this purpose, observed the same appearances not only in that but many other stars: and, by the great regularity that appeared in a series of observations made in all parts of the year, the Doctor was fully satisfied with regard to the general laws of the phenomena; and therefore endeavoured to find out the cause of them. He was already convinced, that the apparent motion of the stars was not owing to a nutation of the earth's axis. The next thing that offered itself, was an alteration in the direction of the plumb line, with which the instrument was constantly rectified; but this, upon trial, proved insufficient. Then he had recourse to what refraction might do; but here also nothing satisfactory occurred. At last this acute astronomer found, that the phenomena in question proceeded from the progressive motion of light, and the earth's annual motion in its orbit: for he perceived, that if light was propagated in time, the apparent place of a fixed object would not be the same when the eye is at rest, as when it is moving in any other direction, than that of the line passing through the eye and object; and that, when the eye is moving in different directions, the apparent place of the object would be different.

ABERRATION, in optics, is used to denote that error or deviation of the rays of light, when inflected by a lens or speculum, whereby they are hindered from meeting or uniting in the same point. There are two species of the aberrations of rays, distinguished by their different causes; one arising from the figure of the glass or speculum, the other from the unequal refrangibility of the rays of light. This last species is sometimes called the Newtonian, from the name of its discoverer. See **OPTICS**, n^o 17. 136. 173.

ABERYSWITH, a market-town of Cardiganshire, in Wales, seated on the Ridal, near its confluence with the Istwith, where it falls into the sea. It is a populous, rich town, and has a great trade in lead, and a considerable fishery of whiting, cod, and herrings. It was formerly surrounded with walls, and fortified with a castle; but both are now in ruins. Its distance from London is 199 miles west-south-west. W. Long. 4. 15. Lat. 52. 30.

ABESTA, the name of one of the sacred books of the Persian magi, which they ascribe to their great founder Zoroaster. The abesta is a commentary on two others of their religious books called *Zend* and *Pazend*; the three together including the whole system of the Ignicold or worshippers of fire.

ABETTOR, a law-term, implying one who encourages another to the performance of some criminal action, or who is art and part in the performance itself. Treason is the only crime in which abettors are excluded by law, every individual concerned being considered as a principal. It is the same with *Art-and-part* in the Scots law.

ABEX, a country in High Ethiopia, in Africa, bordering on the Red Sea, by which it is bounded on the east. It has Nubia or Sennar on the North; Sennar and Abyssinia on the west; and Abyssinia on the south. Its principal towns are Suaquem and Arkeko. It is subject to the Turks, and has the name of the Beglerbeg of Habeleth. It is about five hundred miles in length and one hundred in breadth, and is a wretched country;

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country; for the heat here is almost insupportable, and the air is so unhealthy, that an European cannot stay long in it without the utmost hazard of his life. It is very mountainous, inasmuch that there are many more wild beasts than men. There are forests, in which grow a great number of ebony trees.

ABEYANCE, in law, the expectancy of an estate. Thus if lands be leased to one person for life, with reversion to another for years, the remainder for years is an abeyance till the death of the lessee.

ABGAR, or ABGARUS, a name given to several of the kings of Edessa in Syria. The most celebrated of them is one who, it is said, was cotemporary with Jesus Christ; and who having a distemper in his feet, and hearing of Jesus's miraculous cures, requested him by letter to come and cure him. Eusebius*, who believed that this letter was genuine, and also an answer our Saviour is said to have returned to it, has translated them both from the Syriac, and asserts that they were taken out of the archives of the city of Edessa. The first is as follows: "Abgarus, prince of Edessa, to Jesus the holy Saviour, who hath appeared in the flesh in the confines of Jerusalem, greeting. I have heard of thee, and of the cures thou hast wrought without medicines or herbs. For it is reported thou makest the blind to see, the lame to walk, lepers to be clean, devils and unclean spirits to be expelled, such as have been long diseased to be healed, and the dead to be raised; all which when I heard concerning thee, I concluded with myself, That either thou wast a God come down from heaven, or the Son of God sent to do these things. I have therefore written to thee, beseeching thee to vouchsafe to come unto me, and cure my disease. For I have also heard that the Jews use thee ill, and lay snares to destroy thee. I have here a little city, pleasantly situated, and sufficient for us both. ABGARUS." To this letter, Jesus, it is said, returned an answer by Annanias, Abgarus's courier; which was as follows: "Blessed art thou, O Abgarus: who hast believed in me whom thou hast not seen; for the scriptures say of me, They who have seen me have not believed in me, that they who have not seen, may, by believing, have life. But whereas thou writest to have me come to thee, it is of necessity that I fulfil all things here for which I am sent; and having finished them, to return to him that sent me: but when I am returned to him, I will then send one of my disciples to thee, who shall cure thy malady, and give life to thee and thine. JESUS." After Jesus's ascension, Judas, who is also named Thomas, sent Thaddeus, one of the seventy, to Abgarus; who preached the gospel to him and his people, cured him of his disorder, and wrought many other miracles: which was done, says Eusebius, A. D. 43.—Though the above letters are acknowledged to be spurious by the candid writers of the church of Rome; several Protestant authors, as Dr Parker, Dr Cave, and Dr Grabe, have maintained that they are genuine, and ought not to be rejected.

ABGILLUS (John), surnamed Prester-John, was son to a king of the Frisii; and, from the austerity of his life, obtained the name of *Prester*, or Priest. He attended Charlemagne in his expedition to the Holy Land; but instead of returning with that monarch to Europe, it is pretended that he gained mighty con-

quests, and founded the empire of the *Abyssines*, called, from his name, the empire of Prester John. He is said to have written the history of Charlemagne's journey into the Holy Land, and his own into the Indies; but they are more probably trifling romances, written in the ages of ignorance.

ABIANS, anciently a people of Thrace, or (according to some authors) of Scythia. They had no fixed habitations; they led a wandering life. Their houses were waggons, which carried all their possessions. They lived on the flesh of their herds and flocks, on milk, and cheese, chiefly on that of mare's milk. They were unacquainted with commerce. They only exchanged commodities with their neighbours. They possessed lands but they did not cultivate them. They assigned their agriculture to any who would undertake it, reserving only to themselves a tribute; which they exacted, not with a view to live in affluence, but merely to enjoy the necessaries of life. They never took arms but to oblige those to make good a promise to them by whom it had been broken. They paid tribute to none of the neighbouring states. They deemed themselves exempt from such an imposition; for they relied on their strength and courage, and consequently thought themselves able to repel any invasion. The Abians, we are told, were a people of great integrity. This honourable eulogium is given them by Homer (Strabo).

ABIATHAR, high-priest of the Jews, son to Abimelech, who had borne the same office, and received David into his house. This so enraged Saul, who hated David, that he put Abimelech to death, and 81 priests; Abiathar alone escaped the massacre. He afterwards was high-priest; and often gave king David testimonies of his fidelity, particularly during Absalom's conspiracy, at which time Abiathar followed David, and bore away the ark. But after this, conspiring with Adonijah, in order to raise him to the throne of king David his father; this so exasperated Solomon against him, that he divested him of the priesthood, and banished him, A. M. 3021, before Christ 1014.

ABIB, signifying an ear of corn, a name given by the Jews to the first month of their ecclesiastical year, afterwards called *Nisan*. It commenced at the vernal equinox; and according to the course of the moon, by which their months were regulated; answered to the latter part of our March and beginning of April.

ABIDING by WRITINGS, in Scots law: When a person founds upon a writing alleged to be false, he may be obliged to declare judicially, whether he will stand or abide by it as a true deed.

ABIES, the FIR-TREE. See PINUS.

ABIGEAT, an old law-term, denoting the crime of stealing cattle by droves or herds. This crime was severely punished; the delinquent being often condemned to the mines, banishment, or something capitally.

ABIHU, brother to Nadab, and son to Aaron. The two former had the happiness to ascend mount Sinai with their father, and there to behold the glory of God: but afterward putting strange fire into their censers, instead of the sacred fire commanded by God, fire rushing upon them killed them. Though all the people bewailed this terrible catastrophe, Moses forbade Aaron and his two sons Eleazar and Ithamar to join in the lamentation.

ABII SCYTHÆ, taken by Strabo to denote the European

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Abimelech ropean Sarmatæ, bordering on the Thracians and Bactrianæ: They were commended by Curtius for their love of justice, and by Ammicius for their contempt of earthly things.

Abiponians

ABIMELECH, king of Gerar, a country of the Philistines, was cotemporary with Abraham. This patriarch and his family being there, his wife Sarah, though 90 years of age, was not safe in it; for Abimelech carried her off, and was so enamoured of her, that he resolved to marry her. Abraham did not declare himself Sarah's husband; but gave out she was his sister. But the king being warned in a dream, that she was married to a prophet, and that he should die if he did not restore her to Abraham, the king obeyed: at the same time reproving Abraham for his disingenuity; who thereupon, among other excuses, said she was really his sister, being born of the same father, tho' of a different mother. Abimelech afterwards gave considerable presents to Abraham; and a covenant, that of Beersheba, was entered into between them.—After the death of Abraham, there being a famine in the neighbouring countries, Isaac his son also withdrew into Gerar, which was then likewise governed by a king called—

ABIMELECH, probably the successor of the former. Here Rebekah's beauty forced her husband to employ Abraham's artifice. Abimelech discovering that they were nearly related, chid Isaac for calling his wife his sister; and at the same time forbid all his subjects, upon pain of death, to do the least injury to Isaac or Rebekah—Isaac's prosperity lost him the king's friendship, and he was desired to go from among them. He obeyed; but Abimelech afterwards entered into a covenant with him.

ABIMELECH, the natural son of Gideon, by Druma his concubine. His violent acts and death are recorded in Judges, chap. ix.

ABINGDON, a market-town in Berkshire, seated on a branch of the Thames, received its name from an abbey anciently built there. The streets, which are well paved, centre in a spacious area, in which the market is held; and in the centre of this area is the market-house, which is supported on lofty pillars, with a large hall of free stone above, in which the summer-assizes for the county are held, and other public business done, the Lent assizes being held at Reading. It has two churches; one dedicated to St Nicholas, and the other to St Helena: the latter is adorned with a spire, and both are said to have been erected by the abbots of Abingdon. Here are also two hospitals, one for six, and the other for thirteen poor men, and as many poor women; a free school; and a charity-school. The town was incorporated by Queen Mary. It sends two members to parliament, who are chosen by the inhabitants at large not receiving alms. Its great manufacture is malt, large quantities of which are sent by water to London. It is six miles and a half south of Oxford, 47 east of Gloucester, and 55 west of London. This town is supposed by Bishop Gibson to be the place called, in the Saxon annals, *Cloveshoe*, where two synods are said to have been held, one in 742, and the other in 822. Long. 1. 20. Lat. 51.

ABINTESTATE, in the civil law, is applied to a person who inherits the right of one who died intestate or without making a will. See **INTESTATE**.

ABIPONIANS, a tribe of American Indians, who

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formerly inhabited the district of *Chaks* in Paraguay; but the hostilities of the Spaniards have now obliged them to remove southward into the territory lying between Santa Fe and St Jago. The only account we have of them is that published by M. Dobrizhoffer in 1785. This gentleman, who lived seven years in their country, informs us that they are not numerous, the whole nation not much exceeding 5000; for which he assigns as a reason an unnatural custom among their women of sometimes destroying their own children from motives of jealousy, lest their husbands should take other mates during the long time they give suck, which is not less than two years. They are naturally white, but, by exposure to the air and smoke, become of a brown colour. They are a strong and hardy race of people; which our author attributes to their marrying so late, an Abiponian seldom or never thinking of marriage till 30 years of age. They are greatly celebrated on account of their chastity and other virtues; though, according to our author, they have no knowledge of a Deity. They make frequent incursions into the territories of the Spaniards, mounted on the horses which run wild in those parts. They have a kind of order of chivalry for their warriors; and are so formidable, that 100 of their enemies will fly before ten of these horsemen. The hatred which these savages, whose manners, though rude and uncultivated, are in many respects pure and virtuous, bear to the Spaniards, is invincible. "These pretended Christians," says our author, "who are the scum of the Spanish nation, practise every kind of fraud and villany among these poor barbarians; and their corrupt and vicious morals are so adapted to prejudice the Abiponians against the Christian religion, that the Jesuit missionaries have, by a severe law, prohibited any Spaniard from coming, without a formal permission, into any of their colonies."—From his account of the success of the Jesuits in converting them to Christianity, however, it does not appear that they have been able to do more than bribe them to a compliance with the ceremonies of the Popish superstition; so that in general they are quite ignorant and uncivilized: a most striking instance of which is, that in counting they can go no farther than three; and all the art of the Jesuits to teach them the simplest use and expression of numbers has proved unsuccessful.

ABIRAM, a seditious Levite, who, in concert with Korah and Dathan, rebelled against Moses and Aaron, in order to share with them in the government of the people; when Moses ordering them to come with their censers before the altar of the Lord, the earth suddenly opened under their feet, and swallowed up them and their tents; and at the same instant fire came from heaven, and consumed 250 of their followers. Numb. xvi.

ABISHAI, son of Zeruiah, and brother to Joab, was one of the celebrated warriors who flourished in the reign of David: he killed with his own hand 300 men, with no other weapon but his lance; and slew a Philistine giant, the iron of whose spear weighed 300 shekels. 1 Sam. xxvi. 2 Sam. xxiii.

ABJURATION, in our ancient customs, implied an oath, taken by a person guilty of felony, and who had fled to a place of sanctuary, whereby he solemnly engaged to leave the kingdom for ever.

ABJURATION, is now used to signify the renouncing,

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disclaiming, and denying upon oath, the Pretender to have any kind of right to the crown of these kingdoms.

ABJURATION of Heresy, the solemn recantation of any doctrine as false and wicked.

ABLACTATION, or weaning a child from the breast. See **WEANING**.

ABLACTATION, among the ancient gardeners, the same with what is called *GRAFTING by approach*.

ABLAI, a country of Great Tartary, the inhabitants of which, called *Buchars* or *Buchares*, are subject to Russia, but that only for protection. It lies eastward of the river Irtysh, and extended five hundred leagues along the southern frontiers of Siberia.

ABLACQUEATION, an old term in gardening, signifies the operations of removing the earth and baring the roots of trees in winter, to expose them more freely to the air, rain, snows, &c.

ABLANCOURT. See **PERROT**.

ABLATIVE, in grammar, the sixth case of Latin nouns. The word is formed from *auferre*, "to take away." Priscian also calls it the *comparative case*; as serving among the Latins, for comparing, as well as taking away.

The **ABLATIVE** is opposite to the **DATIVE**; the first expressing the action of taking away, and the latter that of giving.

In English, French, &c. there is no precise mark whereby to distinguish the ablative from other cases; and we only use the term in analogy to the Latin. Thus, in the two phrases, *the magnitude of the city*, and *he spoke much of the city*; we say, that *of the city* in the first is *genitive*, and in the latter *ablative*; because it would be so, if the two phrases were expressed in Latin.

The question concerning the Greek ablative has been the subject of a famous literary war between two great grammarians, Frischlin and Crusius; the former of whom maintained, and the latter opposed, the reality of it. The dispute still subsists among their respective followers. The chief reason alleged by the former is, that the Roman writers often joined Greek words with the Latin propositions, which govern ablative cases, as well as with nouns of the same case. To which their opponents answer, that the Latins anciently had no ablative themselves; but instead thereof, made use, like the Greeks, of the dative case; till at length they formed an ablative, governed by prepositions, which were not put before the dative: that, at first, the two cases had always the same termination, as they still have in many instances: but that this was afterwards changed in certain words. It is no wonder then, that the Latins sometimes join prepositions which govern an ablative case, or nouns in the ablative case, with Greek datives, since they were originally the same; and that the Greek dative has the same effect as the Latin ablative.

ABLE, or **ABEL** (Thomas), chaplain to queen Catharine consort to Henry VIII. distinguished himself by his zeal in opposing the proceedings against that unfortunate princess for a divorce. For this purpose he wrote a piece intitled "*Tractatus de non dissolvendo Henrici et Catharinæ matrimonio*, i. e. A Treatise proving that the marriage of king Henry and queen Catharine ought not to be dissolved." But the title of the book, according to bishop Tanner, was *Invicta Veritas*. He took the degree of Bachelor of Arts at Oxford on the 4th of July 1513, and that of Master of

Arts on the 27th of July 1516. In 1534 he fell under a prosecution for being concerned in the affair of Elizabeth Barton, called the *Holy Maid of Kent*. This was an infamous impostor, suborned by the monks to use some strange gesticulations, and to pretend to inspiration by the spirit of prophecy; and so well did she act her part, that some people of consequence gave credit to her; but being at last detected, she was condemned and executed, after discovering the names of her principal accomplices and instigators. On her account Able was accused of misprision of treason, by stat. 25. Hen. VIII.; and being also one of those who denied the king's supremacy over the church, he was apprehended and imprisoned; during which time his confinement was so rigorous, that the keeper of Newgate was committed to Marshalsea prison for suffering him to go out upon bail. He was afterwards hanged, drawn, and quartered, at Smithfield in 1540. Bouchier gives him the character of a very learned man; and tells us, that he used to teach the queen music and the learned languages.

ABLECTI, in Roman antiquity, a select body of soldiers chosen from among those called **EXTRAORDINARIII**.

ABLEGMINA, in Roman antiquity, those choice parts of the entrails of victims which were offered in sacrifice to the gods. They were sprinkled with flour, and burnt upon the altar; the priests pouring some wine on them.

ABLUENTS, in medicine, the same with diluters or **DILUENTS**.

ABLUTION, in a general sense, signifies the washing or purifying something with water.

ABLUTION, in a religious sense, a ceremony in use among the ancients, and still practised in several parts of the world: it consisted in washing the body, which was always done before sacrificing, or even entering their houses.—Ablutions appear to be as old as any ceremonies, and external worship itself. Moses enjoined them; the heathens adopted them; and Mahomet and his followers have continued them: thus they have got footing among most nations, and make a considerable part of most established religions. The Egyptian priests had their diurnal and nocturnal ablutions; the Grecians their sprinklings; the Romans their lustrations and lavations; the Jews their washing of hands and feet, beside their baptisms. The ancient Christians had their ablutions before communion; which the Romish church still retain before their mass, sometimes after: the Syrians, Cophts, &c. have their solemn washings on Good-Friday: the Turks their greater and lesser ablutions; their Ghast and Wodou, their Aman, Taharat, &c.

ABNER, the son of Ner, father-in-law to Saul, and general of all his forces, who served him on all occasions with fidelity and courage. After the death of that prince, Abner set Ishbosheth, Saul's son, on the throne. A war breaking out between the tribe of Judah who had elected David king, and Israel, Abner marched against that prince with the flower of his troops, but was defeated. Abner afterward, being disguised, went over to David, and disposed the chiefs of the army and the elders of Israel to declare for him; and was received by David with such testimonies of affection, as gave umbrage to Joab, who killed him traitorously.

Ablecti
||
Abner.

Abnoba
||
Abomina-
tion.

ABNOBA, now ABENOW, a long range of mountains in Germany, taking different names according to the different countries they run through. As about the river Maine, called the *Oden* or *Ottenwald*; between Hesse and Franconia, the *Speffart*; and about the duchy of Wirtemberg, where the Danube takes its rise, called the *Baar*.

ABO, a maritime town in Sweden: it is the capital of the province of Finland, and lies upon the point where the gulphs of Bothnia and Finland unite. It is a good port; and is the see of a bishop, suffragan of Upsal. It has an university, founded by queen Christina in 1640, and endowed with the same privileges as that of Upsal. There is also a school here, which was founded by Gustavus Adolphus, for 300 scholars. The town is tolerably well built, and contains several brick buildings; but the generality are of wood painted red. The inhabitants export linen, corn, and planks. It lies 120 miles north-east from Stockholm. E. Long. 21. 28. Lat. 60. 50.

ABOARD, the inside of a ship. Hence any person who enters a ship is said to *go aboard*: but when an enemy enters in the time of battle, he is said to *board*; a phrase which always implies hostility.—To *fall aboard of*, is to strike or encounter another ship when one or both are in motion, or to be driven upon a ship by the force of the wind or current.—*Aboard-main-tack*, the order to draw the main-tack, *i. e.* the lower corner of the main-sail, down to the CHESS-TREE.

ABOLITION, implies the act of annulling, destroying, making void, or reducing to nothing. In law, it signifies the repealing any law or statute.

ABOLLA, a warm kind of garment, lined or doubled, worn by the Greeks and Romans, chiefly out of the city, in following the camp.—Critics and antiquaries are greatly divided as to the form, use, kinds, &c. of this garment. Papias makes it a species of the toga, or gown; but Nonius, and the generality, a species of the pallium, or cloak. The *abolla* seems rather to have stood opposed to the *toga*, which was a garment of peace, as the *abolla* was of war; at least Varro and Martial place them in this opposite light. There seem to have been different kinds of Abollas, fitted to different occasions. Even kings appear to have used the abolla: Caligula was affronted at king Ptolemy for appearing at the shews in a purple abolla, and by the eclat thereof turning the eyes of the spectators from the emperor upon himself.

ABOMASUS, ABOMASUM, or ABOMASIUS, names of the fourth stomach of ruminating animals. It is in the abomasus of calves and lambs that the runnet or curdling is formed wherewith milk is curdled. See COMPARATIVE Anatomy.

ABOMINATION, a term used in scripture with regard to the Hebrews, who, being shepherds, are said to have been an abomination to the Egyptians, because they sacrificed the sacred animals of that people, as oxen, goats, sheep, &c. which the Egyptians esteemed as abominations, or things unlawful. The term is also applied in the sacred writings to idolatry and idols, because the worship of idols is in itself an abominable thing, and at the same time ceremonies observed by idolaters were always attended with licentiousness and other odious and abominable actions. The *abomination of desolation*, foretold by the prophet Daniel, is suppo-

sed to imply the statue of Jupiter Olympius, which Antiochus Epiphanes caused to be placed in the temple of Jerusalem. And the *abomination of desolation*, mentioned by the Evangelists, signifies the ensigns of the Romans, during the last siege of Jerusalem by Titus, on whom the figures of their gods and emperors were embroidered, and placed upon the temple after it was taken.

ABON, ABONA, or ABONIS (anc. geog.), a town and river of Albion. The town, according to Camden, is Abingdon; and the river Abhon or Avon. But by Antonine's Itinerary, the distance is nine miles from the Venta Silurum, or Caer-Went: others, therefore, take the town to be Porshut, at the mouth of the river Avon, over against Bristol. Abhon or Avon, in the Celtic language, denotes a river.

ABORIGINES, (Dionysius of Halicarnassus, Livy, Virgil); originally a proper name, given to a certain people in Italy, who inhabited the ancient Latium, or country now called *Campagna di Roma*. In this sense the Aborigines are distinguished from the Janigenæ, who, according to the false Berofus, inhabited the country before them; from the Siculi, whom they expelled; from the Grecians, from whom they descended; from the Latins, whose name they assumed after their union with Æneas and the Trojans; lastly, from the Aufonii, Volsci, Oenotrii, &c. neighbouring nations in other parts of the country. Whence this people came by the appellation, is much disputed. St Jerom says, they were so called, as being, *absque origine*, the primitive planters of the country after the flood: Dion of Halicarnassus accounts for the name, as denoting them the founders of the race of inhabitants of that country: others think them so called, as being originally Arcadians, who claimed to be earth-born, and not descended from any people. Aurelius Victor suggests another opinion, viz. that they were called *Aborigines*, *q. d. Aberrigines*, from *ab* "from," and *errare* "to wander:" as having been before a wandering people. Pausanias rather thinks they were thus called *αὐτογενεῖς*, from "mountains;" which opinion seems confirmed by Virgil, who, speaking of Saturn, the legislator of this people, says,

Is genus indocile ac dispensum montibus altis

Composuit, legesque dedit.—

The Aborigines were either the original inhabitants of the country, settled there by Janus, as some imagine; or by Saturn, or Cham, as others; not long after the dispersion, or even, as some think, before it: Or they were a colony sent from some other nation; who expelling the ancient inhabitants the Siculi, settled in their place.—About this mother-nation there is great dispute. Some maintain it to be the Arcadians, parties of whom were brought into Italy at different times; the first under the conduct of Oenotrius, son of Lycaon, 450 years before the Trojan war; a second from Thessaly; a third under Evander, 60 years before the Trojan war: besides another under Hercules; and another of Lacedæmonians, who fled from the severe discipline of Lycurgus: all these uniting, are said to have formed the nation or kingdom of the Aborigines. Others will have them of barbarian rather than Grecian origin, and to have come from Scythia; others from Gaul. Lastly, others will have them to be Canaanites, expelled by Joshua.

Abon,
Aborigines.

Abortian
||
Aboukir.

The term *Aborigines*, though so famous in antiquity, is used in modern geography only occasionally as an appellative. It is given to the primitive inhabitants of a country, in contradistinction to colonies, or new races of people.

ABORTION, in midwifery, the exclusion of a fœtus before it has acquired a sufficient degree of perfection to enable it to perform respiration and the other vital functions. See MIDWIFERY.

The practice of procuring abortions was prohibited by the ancient Greek legislators Solon and Lycurgus. Whether or not it was permitted among the Romans, has been much disputed. It is certain the practice, which was by them called *visceribus vim inferre*, was frequent enough: but whether there was any penalty on it before the emperors Severus and Antonine, is the question. Nodt maintains the negative; and further, that those princes only made it criminal in one particular case, viz. of a married woman's practising it out of resentment against her husband, in order to defraud him of the comfort of children: this was ordered to be punished by a temporary exile. The foundation on which the practice is said to have been allowed, was, that the fœtus, while *in utero*, was reputed as a part of the mother, ranked as one of her own viscera, over which she had the same power as over the rest: besides, that it was not reputed as a man, *homo*; nor to be alive, otherwise than as a vegetable: consequently, that the crime amounted to little more than that of plucking unripe fruit from the tree. Seneca represents it as a peculiar glory of Helvia, that she had never, like other women, whose chief study is their beauty and shape, destroyed the fœtus in her womb. The primitive fathers, Athenagoras, Tertullian, Minutius Felix, Augustin, &c. declaimed loudly against the practice as virtual murder. Several councils have condemned it. Yet we are told that the modern Romish ecclesiastical laws allow of dispensations for it. Egane mentions the rates at which a dispensation for it may be had.

The practice of artificial abortion is chiefly in the hands of women and nurses, rarely in that of physicians; who, in some countries, are not admitted to the profession without abjuring it. Hippocrates, in the oath he would have enjoined on all physicians, includes their not giving the *pessus abortivus*; though elsewhere he gives the formal process whereby he himself procured in a young woman a miscarriage. It may, however, be observed, that often all the powers of art prove ineffectual, and no less often do the attempts prove the means of punishment by the fatal consequences which they produce.

ABORTION, among gardeners, signifies such fruits as are produced too early, and never arrive at maturity.

ABORTIVE, is, in general, applied to whatever comes before its legitimate time, or to any design which miscarries.

ABORTIVE Corn, a distemper of corn mentioned by M. Gillet, and suspected to be occasioned by insects. It appears long before harvest, and may be known by a deformity of the stalk, the leaves, the ear, and even the grain.

ABORTIVE Vellum, is made of the skin of an abortive calf.

ABOUKIR, a small town of Egypt, situate in the desert between Alexandria and Rosetta. It is the an-

cient Canopus, and is situated, according to Mr Savary, six leagues from Pharos. Pliny says, from the testimonies of antiquity, that it was formerly an island: and its local appearance makes this credible; for the grounds around it are so low, that the sea still covered a part of them in the days of Strabo. The town is built upon a rock, which forms a handsome road for shipping, and was out of the reach of inundations. See CANOPUS.

ABOUT, the situation of a ship immediately after she has tacked, or changed her course by going about and standing on the other tack.—*About ship!* the order to the ship's crew for tacking.

ABOUTIGE, a town in Upper Egypt, in Africa, near the Nile, where they make the best opium in all the Levant. It was formerly a large, but now is a mean place. N. Lat. 26. 50.

ABRA, a silver coin struck in Poland, and worth about one shilling Sterling. It is current in several parts of Germany, Constantinople, Astracan, Smyrna, and Grand Cairo.

ABRABANEL, ABARBANEL, or AVRAVANEL, (Isaac), a celebrated rabbi, descended from King David, and born at Lisbon A. D. 1437. He became counsellor to Alphonso V. king of Portugal, and afterwards to Ferdinand the Catholic; but in 1492 was obliged to leave Spain with the other Jews. In short, after residing at Naples, Corfu, and several other cities, he died at Venice in 1508, aged 71. Abrabanel passed for one of the most learned of the rabbis; and the Jews gave him the names of the Sage, the Prince, and the Great Politician. We have a commentary of his on all the Old Testament, which is pretty scarce: he there principally adheres to the literal sense; and his style is clear, but a little diffuse. His other works are, A Treatise on the Creation of the world; in which he refutes Aristotle, who imagined that the world was eternal: A Treatise on the Explication of the Prophecies relating to the Messiah, against the Christians: A book concerning Articles of Faith; and some others less sought after. Though Abrabanel discovers his implacable aversion to Christianity in all his writings, yet he treated Christians with politeness and good manners in the common affairs of life.

ABRACADABRA, a magical word, recommended by Serenus Samonicus as an antidote against agues and several other diseases. It was to be written upon a piece of paper as many times as the word contains letters, omitting the last letter of the former every time, as in the margin†, and repeated in the same order; and then suspended about the neck by a linen thread. *Abracadabra* was the name of a god worshipped by the Syrians; so wearing his name was a sort of invocation of his aid; a practice which, though not more useful, yet was less irrational, than is the equally heathenish practice among those who call themselves Christians, of wearing various things, in expectation of their operating by a Sympathy, whose parents were Ignorance and Superstition.

ABRAHAM, the father and stock whence the faithful sprung, was the son of Terah. He was descended from Noah by Shem, from whom he was nine degrees removed. Some fix his birth in the 130th year of Terah's age, but others place it in his father's 70th year. It is highly probable he was born in the city of Ur, in Chaldea, which he and his father left when they went

About
||
Abraham.

†
abracadabra
abracadabr
abracadab
abracada
abracad
abrac
abrac
abr
ab
a

Abraham went to Canaan, where they remained till the death of Terah; after which, Abraham resumed his first design of going to Palestine. The Scriptures mention the several places he stopped at in Canaan; his journey into Egypt, where his wife was carried off from him; his going into Gerar, where Sarah was again taken from him, but restored as before; the victory he obtained over the four kings who had plundered Sodom; his compliance with his wife, who insisted that he should make use of their maid Hagar in order to raise up children; the covenant God made with him, sealed with the ceremony of circumcision; his obedience to the command of God, who ordered him to offer up his only son as a sacrifice, and how this bloody act was prevented; his marriage with Keturah; his death at the age of 175 years; and his interment at the cave of Macpelah, near the body of Sarah his first wife. It would be of little use to dwell long upon these particulars, since they are so well known. But tradition has supplied numberless others, the mention of one or two of which may not be unacceptable.

Many extraordinary particulars have been told relating to his conversion from idolatry. It is a pretty general opinion, that he sucked in the poison with his milk; that his father made statues, and taught that in they were to be worshipped as gods*. Some Jewish authors relate†, that Abraham followed the same trade with Terah for a considerable time. Maimonides‡ says, that he was bred up in the religion of the Sabæans, who acknowledged no deity but the stars; that his reflections on the nature of the planets, his admiration of their motions, beauty, and order, made him conclude there must be a being superior to the machine of the universe, a being who created and governed it; however, according to an old tradition, he did not renounce Paganism till the 50th year of his age. It is related||, that his father, being gone a journey, left him to sell the statues in his absence; and that a man, who pretended to be a purchaser, asked him how old he was: Abraham answered, "Fifty."—"Wretch that thou art (said the other), for adoring at such an age a being which is but a day old!" These words greatly confounded Abraham. Some time afterwards, a woman brought him some flour, that he might give it as an offering to the idols; but Abraham, instead of doing so, took up a hatchet and broke them all to pieces, excepting the largest, into the hand of which he put the weapon. Terah, at his return, asked whence came all this havock? Abraham made answer, that the statues had had a great contest which should eat first of the oblation; "Upon which (said he), the god you see there, being the stoutest, hewed the others to pieces with that hatchet." Terah told him this was bantering; for those idols had not the sense to act in this manner. Abraham retorted these words upon his father against the worshipping of such gods. Terah, stung with this raillery, delivered up his son to the cognizance of Nimrod, the sovereign of the country: who exhorted Abraham to worship the fire; and, upon his refusal, commanded him to be thrown into the midst of the flames: "Now let your God (said he) come and deliver you." But (adds the tradition) Abraham came safe and sound out of the flames.—This tradition is not of modern date, since it is told by St Jerom§; who seems to credit it in general, but disbe-

lieves that part of it which makes Terah so cruel as to be the informer against his own son. Perhaps the ambiguity of the word *Ur** might have given rise to the fiction altogether. Such as lay stress on the following words which God says to Abraham (Gen. xv. 7.), *am the Lord that brought thee out of Ur of the Chaldees*, imagine that he saved him from a great persecution, since he employed the very same words in the beginning of the decalogue to denote the deliverance from Egypt.

Abraham is said to have been well skilled in many sciences, and to have wrote several books. Josephus† tells us that he taught the Egyptians arithmetic and geometry; and, according to Eupolemus and Artapan, he instructed the Phœnicians, as well as the Egyptians, in astronomy. A work which treats of the creation has been long ascribed to him: it is mentioned in the Talmud‡, and the Rabbis Chanina and Hofchia used to read it on the eve before the sabbath. In the first ages of Christianity, according to St Epiphanius||, a heretical sect, called *Sethinians*, dispersed a piece which had the title of *Abraham's Revelation*. Origen mentions also a treatise supposed to be wrote by this patriarch. All the several works which Abraham composed in the plains of Mamre, are said to be contained in the library of the monastery of the Holy Cross on Mount Amara in Ethiopia§. The book on the creation was printed at Paris 1552, and translated into Latin by Postel: Rittangel, a converted Jew, and professor at Königsberg, gave also a Latin translation of it, with remarks, in 1642.

ABRAHAM USQUE, a Portuguese Jew, who translated the Bible out of Hebrew into Spanish. It was printed at Ferrara in 1553, and reprinted in Holland in 1630. This Bible, especially the first edition, which is most valuable, is marked with stars at certain words, which are designed to show that these words are difficult to be understood in the Hebrew, and that they may be used in a different sense.

ABRAHAM (Nicholas), a learned Jesuit, born in the diocese of Toul, in Lorraine, in 1589. He obtained the rank of divinity professor in the university of Pont-a-Mousson, which he enjoyed 17 years, and died September 7, 1655. He wrote Notes on Virgil and on Nonnius; A Commentary on some of Cicero's Orations, in two vols folio; an excellent collection of theological pieces in folio, intitled *Pharus Veteris Testamenti*; and some other works.

ABRAHAMITES, an order of monks exterminated for idolatry by Theophilus in the ninth century. Also the name of another sect of heretics who had adopted the errors of Paulus. See PAULICIANS.

ABRANTES, a town of Portugal, in Estremadura, seated on the river Tajo, belongs to a marquis of the same name. It stands high, is surrounded with gardens and olive trees, and contains thirty-five thousand inhabitants. It has four convents, an alms-house, and an hospital. W. Long. 7. 18. Lat. 39. 13.

ABRASAX, or ABRAXAS, the supreme god of the Basilidian heretics. It is a mystical word, composed of the Greek numerals α, β, γ, δ, ε, ζ, η, θ, which together make up the number CCCLXV. For Basilides taught, that there were 365 heavens between the earth and the empyrean; each of which heavens had its angel or intelligence, which created it; each of which angels like-

Abraham
|| Abrafax.

* It is the proper name of a city, and it also signifies fire. The Lat. version of the Septuagint has it thus: Qui elegit eum de igne Chaldeorum.

† Antiq. lib. i. cap. 7.

‡ Heidegger Hist. Patriarch. tom. ii. p. 143. Advers. Har. p. 286.

§ Kirchem's treatise of libraries, p. 142.

* Suidas, in they were to be worshipped as gods*. Some Jewish authors relate†, that Abraham followed the same trade with Terah for a considerable time. Maimonides‡ says, that he was bred up in the religion of the Sabæans, who acknowledged no deity but the stars; that his reflections on the nature of the planets, his admiration of their motions, beauty, and order, made him conclude there must be a being superior to the machine of the universe, a being who created and governed it; however, according to an old tradition, he did not renounce Paganism till the 50th year of his age. It is related||, that his father, being gone a journey, left him to sell the statues in his absence; and that a man, who pretended to be a purchaser, asked him how old he was: Abraham answered, "Fifty."—"Wretch that thou art (said the other), for adoring at such an age a being which is but a day old!" These words greatly confounded Abraham. Some time afterwards, a woman brought him some flour, that he might give it as an offering to the idols; but Abraham, instead of doing so, took up a hatchet and broke them all to pieces, excepting the largest, into the hand of which he put the weapon. Terah, at his return, asked whence came all this havock? Abraham made answer, that the statues had had a great contest which should eat first of the oblation; "Upon which (said he), the god you see there, being the stoutest, hewed the others to pieces with that hatchet." Terah told him this was bantering; for those idols had not the sense to act in this manner. Abraham retorted these words upon his father against the worshipping of such gods. Terah, stung with this raillery, delivered up his son to the cognizance of Nimrod, the sovereign of the country: who exhorted Abraham to worship the fire; and, upon his refusal, commanded him to be thrown into the midst of the flames: "Now let your God (said he) come and deliver you." But (adds the tradition) Abraham came safe and sound out of the flames.—This tradition is not of modern date, since it is told by St Jerom§; who seems to credit it in general, but disbe-

|| Heidegger Hist. Patriarch. tom. iii. p. 36.

§ Tradit. Hebraic in Genesin.

Abraſion
||
Abreast.

wife was created by the angel next above it; thus ascending by a ſcale to the Supreme being, or firſt Creator. The Baſilidians uſed the word *Abraxas* by way of charm or amulet.

ABRASION is ſometimes uſed among medicinal writers for the effect of ſharp corroſive medicines or humours in wearing away the natural mucus which covers the membranes, and particularly thoſe of the ſtomach and inteſtines. The word is compoſed of the Latin *ab* and *rado*, to ſhave or ſcrape off.

ABRAVANNUS (anc. geog.), the name of a promontory and river of Galloway in Scotland, ſo called from the Celtic terms *Aber*, ſignifying either the mouth of a river or the confluence of two rivers, and *Avon*, a river.

ABRAUM, in natural hiſtory, a name given by ſome writers to a ſpecies of red clay, uſed in England by the cabinet-makers, &c. to give a red colour to new mahogany wood. We have it from the Iſle of Wight; but it is alſo found in Germany and Italy.

ABRAXAS, an antique ſtone with the word *abraxas* engraven on it. They are of various ſizes, and moſt of them as old as the third century. They are frequent in the cabinets of the curious; and a collection of them, as complete as poſſible, has been deſired by ſeveral. There is a fine one in the abbey of St Genevieve, which has occaſioned much ſpeculation. Moſt of them ſeem to have come from Egypt; whence they are of ſome uſe for explaining the antiquities of that country. Sometimes they have no other inſcription beſides the word: but others have the names of ſaints, angels, or Jehovah himſelf annexed; though moſt uſually the name of the Baſilidian god. Sometimes there is a representation of Iſis ſitting on a lobes, or apis, ſurrounded with ſtars; ſometimes monſtrous compoſitions of animals, obſcene images, Phalli and Ithyfalli. The graving is rarely good, but the word on the reverſe is ſometimes ſaid to be in a more modern taſte than the other. The characters are uſually Greek, Hebrew, Coptic, or Hetnerian, and ſometimes of a mongrel kind, invented, as it would ſeem, to render their meaning the more inſcrutable. It is diſputed whether the Veronica of Montreuil, or the granite obeliſk mentioned by Gori, be *Abraxas*.

ABREAST (a ſea term), ſide by ſide, or oppoſite to; a ſituation in which two or more ſhips lie, with their ſides parallel to each other, and their heads equally advanced. This term more particularly regards the line of battle at ſea, where, on the different occaſions of attack, retreat, or purſuit, the ſeveral ſquadrons or diviſions of a fleet are obliged to vary their diſpoſitions, and yet maintain a proper regularity by ſailing in right or curved lines. When the line is formed abreast, the whole ſquadron advances uniformly, the ſhips being equally diſtant from and parallel to each other, ſo that the length of each ſhip forms a right angle with the extent of the ſquadron or line abreast. The commander in chief is always ſtationed in the centre, and the ſecond and third in command in the centres of their reſpective ſquadrons.—*Abreast*, within the ſhip, implies on a line with the beam, or by the ſide of any object aboard; as, the frigate ſprung a leak abreast of the main hatch-way, *i. e.* on the ſame line with the main hatch-way, croſſing the ſhip's length at right angles, in oppoſition to *AFORE* or *ABAFT* the hatch-way.—We

discovered a fleet abreast of Beachy-head; *i. e.* off, or directly oppoſite to it.

ABRETTENE, or ABRETTINE (anc. geog.), a diſtrict of Myſia, in Aſia. Hence the epithet *Abrette-nus* given Jupiter (Strabo); whoſe prieſt was Cleon, formerly at the head of a gang of robbers, and who received many and great favours at the hand of Antony, but afterwards went over to Auguſtus. The people were called *Abretteni*; inhabiting the country between Ancyra of Phrygia and the river Rhyndacus.

ABRIDGEMENT, in literature, a term ſignifying the reduction of a book into a ſmaller compaſs.

The art of conveying much ſentiment in few words, is the happieſt talent an author can be poſſeſſed of. This talent is peculiarly neceſſary in the preſent ſtate of literature; for many writers have acquired the dexterity of ſpreading a few tritica! thoughts over ſeveral hundred pages. When an author hits upon a thought that pleaſes him, he is apt to dwell upon it, to view it in different lights, to force it in improperly, or upon the ſlighteſt relations. Though this may be pleaſant to the writers, it tires and vexes the reader. There is another great ſource of diſſuſion in compoſition. It is a capital object with an author, whatever be the ſubject, to give vent to all his beſt thoughts. When he finds a proper place for any of them, he is peculiarly happy. But rather than ſacrifice a thought he is fond of, he forces it in by way of digreſſion, or ſuperfluous illuſtration. If none of theſe expedients answer his purpoſe, he has recourſe to the margin, a very convenient apartment for all manner of pedantry and impertinence. There is not an author, however correct, but is more or leſs faulty in this reſpect. An abridger, however, is not ſubject to theſe temptations. The thoughts are not his own; he views them in a cooler and leſs affectionate manner; he diſcovers an impropriety in ſome, a vanity in others, and a want of utility in many. His buſineſs, therefore, is to retrench ſuperfluities, digreſſions, quotations, pedantry, &c. and to lay before the public only what is really uſeful. This is by no means an eaſy employment: To abridge ſome books, requires talents equal, if not ſuperior, to thoſe of the author. The facts, manner, ſpirit, and reaſoning muſt be preſerved; nothing eſſential, either in argument or illuſtration, ought to be omitted. The difficulty of the taſk is the principal reaſon why we have ſo few good abridgements: Wynne's abridgement of Locke's Eſſay on the Human Underſtanding, is perhaps the only unexceptionable one in our language.

Theſe obſervations relate ſolely to ſuch abridgements as are deſigned for the public. But,

When a perſon wants to ſet down the ſubſtance of any book, a ſhorter and leſs laborious method may be followed. It would be foreign to our plan to give examples of abridgements for the public: But as it may be uſeful, eſpecially to young people, to know how to abridge books for their own uſe, after giving a few directions, we ſhall exhibit an example or two, to ſhow with what eaſe it may be done.

Read the book carefully; endeavour to learn the principal view of the author; attend to the arguments employed: When you have done ſo, you will generally find, that what the author uſes as new or additional arguments, are in reality only collateral ones, or extenſions of the principal argument. Take a piece of

Abridge-
ment.

paper or a common-place book, put down what the author wants to prove, subjoin the argument or arguments, and you have the substance of the book in a few lines. For example,

In the Essay on Miracles, Mr Hume's design is to prove, That miracles which have not been the immediate objects of our senses, cannot reasonably be believed upon the testimony of others.

Now, his argument (for there happens to be but one) is,

"That experience, which in some things is variable, in others uniform, is our *only* guide in reasoning concerning matters of fact. A variable experience gives rise to probability only; an uniform experience amounts to a proof. Our belief of any fact from the testimony of eye-witnesses is derived from no other principle than our experience in the veracity of human testimony. If the fact attested be miraculous, here arises a contest of two opposite experiences, or proof against proof. Now, a miracle is a violation of the laws of nature; and as a firm and unalterable experience has established these laws, the proof against a miracle, from the very nature of the fact, is as complete as any argument from experience can possibly be imagined; and if so, it is an undeniable consequence, that it cannot be surmounted by any proof whatever derived from human testimony."

In Dr Campbell's Dissertation on Miracles, the author's principal aim is to show the fallacy of Mr Hume's argument; which he has done most successfully by another single argument, as follows:

"The evidence arising from human testimony is not *solely* derived from experience: on the contrary, testimony hath a natural influence on belief antecedent to experience. The early and unlimited assent given to testimony by children gradually contracts as they advance in life: it is, therefore, more consonant to truth to say, that our *diffidence* in testimony is the result of experience, than that our *faith* in it has this foundation. Besides, the uniformity of experience, in favour of any fact, is not a proof against its being reversed in a particular instance. The evidence arising from the single testimony of a man of known veracity will go farther to establish a belief in its being actually reversed: If his testimony be confirmed by a few others of the same character, we cannot withhold our assent to the truth of it. Now, tho' the operations of nature are governed by uniform laws, and though we have not the testimony of our senses in favour of any *violation* of them; still, if in particular instances we have the testimony of *thousands* of our fellow-creatures, and those too men of strict integrity, swayed by no motives of ambition or interest, and governed by the principles of common-sense, That they were actually eye-witnesses of these violations, the constitution of our nature obliges us to believe them."

These two examples contain the substance of about 400 pages.—Making private abridgments of this kind has many advantages; it engages us to read with accuracy and attention; it fixes the subject in our minds; and, if we should happen to forget, instead of reading the books again, by glancing a few lines we are not only in possession of the chief arguments, but recal in a good measure the author's method and manner.

VOL. I. Part I.

Abridging is peculiarly useful in taking the substance of what is delivered by Professors, &c. It is impossible, even with the assistance of short-hand, to take down *verbatim*, what is said by a public speaker. Besides, although it were practicable, such a talent would be of little use. Every public speaker has circumlocutions, redundancies, lumber, which deserve not to be copied. All that is really useful may be comprehended in a short compass. If the plan of the discourse, and arguments employed in support of the different branches, be taken down, you have the whole. These you may afterwards extend in the form of a discourse dressed in your own language. This would not only be a more rational employment, but would likewise be an excellent method of improving young men in composition; an object too little attended to in all our universities.

ABRINCATARUM OPPIDUM (anc. geog.), the town of the *Abrincate* or *Abrincatui*, now *Auranches* in France, situated on an eminence in the south-west of Normandy near the borders of Brittany on the English channel. W. Long. 1. 10. N. Lat. 48. 40.

ABROGATION, the act of abolishing a law, by authority of the maker; in which sense the word is synonymous with abolition, repealing, and revocation.

Abrogation stands opposed to *rogation*: it is distinguished from *derogation*, which implies the taking away only some part of a law; from *subrogation*, which denotes the adding a clause to it; from *obrogation*, which implies the limiting or restraining it; from *dispensation*, which only sets it aside in a particular instance; and from *antiquation*, which is the refusing to pass a law.

ABROKANI, or MALLEMOLLI, a kind of muslin, or clear white fine cotton cloth, brought from the East Indies, particularly from Bengal; being in length 16 French ells and 3 quarters, and in breadth 5 eighths.

ABROLKOS, the name of certain shelves, or banks of sand, about 20 leagues from the coast of Brazil.

ABROTANUM, in botany. See ARTIMISIA and SANTOLINA.

ABROTONUM (anc. geog.), a town and harbour on the Mediterranean, in the district of Syrtis Parva, in Africa, one of the three cities that went to form Tripoly.

ABRUS, in botany, the trivial name of the GLYCINE.

ABRUZZO, a province in Naples. The river Pescara divides it into two parts; one of which is called Ulterior, whereof Aquila is the capital; and the other Citerior, whose capital is Solomona. Besides the Apennines, there are two considerable mountains, the one called Monte Cavallo, and the other Monte Maiello; the top of which last is always covered with snow. Abruzzo is a cold country; but the rigour of the climate is not so great as to prevent the country from producing in abundance every thing requisite for the support of life. Vegetables, fruits, animals, and numberless other articles of sustenance, not only furnish ample provision for the use of the natives, but also allow of exportation. There is so large a quantity of wheat reaped, that many thousands of quarters are annually shipped off. Much Turkey wheat is sent out, and the province of Teramo sells a great deal of rice little inferior in goodness to that of Lombardy. Oil is a plentiful commodity, and wines are made for exportation on many parts of the coast; but wool has always been,

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Abruzzo. and still is, their staple commodity: the flocks, after passing the whole summer in the fine pastures of the mountains, are driven for the winter into the warm plains of Puglia, and a few spots near their own coast, where the snow does not lie; there are no manufactures of woollens in the province, except two small ones of coarse cloth, and the greatest part of the wool is sent out unwrought. No silk is made here, though mulberry-trees would grow well in the low grounds.

Formerly the territory of Aquila furnished Italy almost exclusively with saffron; but since the culture of that plant has been so much followed in Lombardy, it has fallen to nothing in Abruzzo. In the maritime tracts of country the cultivation of liquorice has been increased of late years, but foreigners export the roots in their natural state: in the province of Teramo there is a manufactory of pottery-ware, for which there is a great demand in Germany, by the way of Trieste, as it is remarkably hard and fine; but even this is going to decay, by being abandoned entirely to the ignorance of common workmen. It is not to be expected that any improvements will be made in arts and manufactures, where the encouragement and attention of superiors is wanting, and no pains taken to render the commodity more marketable, or to open better channels of sale for it. The only advantages these provinces enjoy, are the gift of benevolent nature; but she has still greater presents in store for them, and waits only for the helping hand of government to produce them. This whole coast, one hundred miles in length, is utterly destitute of sea-ports; and the only spots where the produce can be embarked are dangerous inconvenient roads, at the mouths of rivers and along a lee-shore: the difficulty of procuring shipping, and of loading the goods, frequently causes great quantities of them to rot on hand; which damps industry, and prevents all improvements in agriculture. The husbandman is a poor dispirited wretch, and wretchedness produces emigration: the uneven surface of the country occasions it to be inhabited by retail, if the expression may be used, rather than in large masses; for there is not a city that contains ten thousand people, and the most of them would find it difficult to muster three thousand. Villages, castles, and feudatory estates, are to be met with in abundance; but the numbers of their inhabitants are to be reckoned by hundreds, not thousands: in a word, the political and social system of the province shows no signs of the vigour which nature so remarkably displays here in all her operations.

The antiquary and the naturalist may travel here with exquisite pleasure and profit; the former will find treasures of inscriptions, and inedited monuments appertaining to the warlike nations that once covered the face of the country: the natural philosopher will have a noble field for observation in the stupendous monuments that rise on all sides. Monte-corno and Majella are among the most interesting; the first is like an aged monument of nature, bald, and horribly broken on every aspect: from various appearances, it is evident that its bowels contain many valuable veins of metallic ore; but the great difficulty of access renders the search of them almost impracticable. Majella has other merits, and of a gayer kind:—nature has clothed its declivities and elevated fields with an infinite variety of her most precious plants; vulnerary herbs grow there

in as great perfection as on the Alps of Switzerland, and are applied by the natives to wounds with equal success.

The character of the inhabitants varies a little among themselves, according to situation and climate, but essentially from the disposition of the natives of the more southern provinces. This proceeds from a difference of origin: for the Lombards, who were barbarians, but not cruel; poor, but hospitable; endowed with plain honest sense, though possessed of little acuteness or subtlety; remained peaceable proprietors of these mountainous regions, till the Normans, who were accustomed to similar climate, came, and dispossessed them. The Greeks, who retained almost every other part of the kingdom under their dominion, never had any sway here. For this reason the Abruzzesi still bear a great resemblance to their northern progenitors or masters: to this day, one may trace in them the same goodness of heart, but great indolence, and repugnance to lively exertions; a fault that proceeds rather from a want of active virtue, than a disposition to wickedness. Hence it comes that in these provinces, where the proximity of the frontier almost insures impunity, fewer atrocious and inhuman deeds are heard of than in other parts of the realm. Remnants of ancient northern customs existed here so late as the beginning of this century, and, among the mountaineers, very evident traces of the Frank and Teutonic languages may be discovered.

ABSALOM, the son of David by Maacah, was brother to Thamar, David's daughter, who was ravished by Amnon their eldest brother by another mother. Absalom waited two years for an opportunity of revenging the injury done to his sister; and at last procured the assassination of Amnon at a feast which he had prepared for the king's sons. He took refuge with Talmai king of Geshur; and was no sooner restored to favour, but he engaged the Israelites to revolt from his father. Absalom was defeated in the wood of Ephraim: as he was flying, his hair caught hold of an oak, where he hung till Joab came and thrust him through with three darts: David had expressly ordered his life to be spared, and extremely lamented him.

ABSCISS, in surgery; from *abscedo*, to depart. A cavity containing pus; or, a gathering of matter in a part; So called, because the parts which were joined are now separated; one part recedes from another, to make way for the collected matter. See **SURGERY**.

ABSCISSE, in conics, a part of the diameter or transverse axis of a conic section intercepted between the vertex or some other fixed point and a semiordinate. See *Conic Sections*.

ABSCONSA, a dark lantern used by the monks at the ceremony of burying their dead.

ABSCENCE, in Scots law: When a person cited before a court does not appear, and judgment is pronounced, that judgment is said to be *in absence*. No person can be tried criminally in absence.

ABSINTHIATED, any thing tinged or impregnated with absinthium or wormwood. Bartholin mentions a woman whose milk was become absinthiated, and rendered as bitter as gall, by the too liberal use of wormwood.

Vidum absinthites, or *poculum absinthiatum*, "wormwood wine," is much spoke of among the ancients as a whole-

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Abinthium wholesome drink, and even an antidote against drunkenness; though some have charged it with being offensive to the head, and liable to cause fevers, caphalgias, vomitings, uterine fluxes, &c. Ray also makes it a preventative of venery. According to the common opinion, it is made by infusing the leaves of the plant in wine; but, according to Fehr, it ought to be prepared by fermentation, in order to correct the crudities, and call forth a volatile salt; which last, however, does not exist in wormwood. Some prefer the distilled water; but whatever virtues wormwood possesses reside entirely in its essential oil.

ABSINTHIUM, in botany, the trivial name of the common wormwood. See the article **ARTEMISIA**.

ABSIS, in astronomy, the same with **apsis**. See **APSIS**.

ABSOLUTE, in a general sense, something that stands free or independent.

ABSOLUTE is more particularly understood of a being or thing which does not proceed from any cause, or does not subsist by virtue of any other being, considered as its cause; in which sense, God alone is *absolute*. *Absolute*, in this sense, is synonymous with *independent*, and stands opposed to *dependent*.

ABSOLUTE also denotes a thing's being free from conditions or limitations; in which sense, the word is synonymous with *unconditional*. We say, an *absolute* decree, *absolute* promise, *absolute* obedience.

ABSOLUTE Government, that wherein the prince is left solely to his own will, being not limited to the observance of any laws except those of his own discretion.

ABSOLUTE Equation, in astronomy, is the aggregate of the optic and eccentric equations. The apparent inequality of a planet's motion arising from its not being equally distant from the earth at all times, is called its optic equation, and would subsist even if the planet's real motion were uniform. The eccentric inequality is caused by the planet's motion being uniform. To illustrate which, conceive the sun to move, or to appear to move, in the circumference of a circle, in whose centre the earth is placed. It is manifest, that if the sun moves uniformly in this circle, it must appear to move uniformly to a spectator on the earth, and in this case there will be no optic nor eccentric equation: but suppose the earth to be placed out of the centre of the circle, and then, though the sun's motion should be really uniform, it would not appear to be so, being seen from the earth; and in this case there would be an optic equation, without an eccentric one. Imagine farther, the sun's orbit to be not circular, but elliptic, and the earth in its focus; it will be as evident that the sun cannot appear to have an uniform motion in such ellipse: so that his motion will then be subject to two equations, the optic and the eccentric.

ABSOLUTE Number, in algebra, is any pure number standing in any equation without the conjunction of literal characters; as $2x + 36 = 48$; where 36 and 48 are absolute numbers, but 2 is not, as being joined with the letter x.

ABSOLUTION, in civil law, is a sentence whereby the party accused is declared innocent of the crime laid to his charge.—Among the Romans, the ordinary method of pronouncing judgment was this: after the cause

had been pleaded on both sides, the præco used the word *dixerunt*, q. d. they have said what they had to say; then three ballots were distributed to each judge, marked as mentioned under the article A; and as the majority fell of either mark, the accused was *absolved* or condemned, &c. If he were absolved, the prætor dismissed him with *videtur non fecisse*, or *jure videtur fecisse*.

ABSOLUTION, in the canon law, is a juridical act, whereby the priest declares the sins of such as are penitent remitted.—The Romanists hold absolution a part of the sacrament of penance: the council of Trent, sess. xiv. cap. iii. and that of Florence, in the decree *ad Armenos*, declare the form or essence of the sacrament to lie in the words of *absolution*, I absolve thee of thy sins. The formula of absolution, in the Romish church, is absolute: in the Greek church, it is deprecatory; and in the churches of the reformed, declarative.

ABSOLUTION is chiefly used among Protestants for a sentence whereby a person who stands excommunicated is released or freed from that punishment.

ABSORBENT, in general, any thing possessing the faculty of *absorbing*, or swallowing up another.

ABSORBENT Medicines, testaceous powders, as chalk, crab-eyes, &c. which are taken inwardly for drying up or absorbing any acid or redundant humours in the stomach or intestines. They are likewise applied outwardly to ulcers or sores with the same intention.

ABSORBENT Vessels, a name given promiscuously to the lacteal vessels, lymphatics, and inhalent arteries. See **ANATOMY**.

Naturalists speak of the like absorbents in plants, the fibrous or hairy roots of which are as a kind of vasa absorbentia, which attract and imbibe the nutritious juices from the earth. See **PLANTS**.

ABSORBING, the swallowing up, sucking up, or imbibing, any thing: thus black bodies are said to absorb the rays of light; luxuriant branches, to absorb or waste the nutritious juices which should feed the fruit of trees, &c.

ABSORPTION, in the animal œconomy, is the power whereby the absorbent vessels imbibe the juices, &c.

ABSORPTIONS of the Earth, a term used by Kircher and others for the sinking in of large tracts of land by means of subterranean commotions, and many other accidents.

Pliny tells us, that in his time the mountain Cymbotus, with the town of Eurites, which stood on its side, were wholly absorbed into the earth, so that not the least trace of either remained; and he records the like fate of the city Tantalus in Magnesia, and after it of the mountain Sypelus, both thus absorbed by a violent opening of the earth. Galanis and Garnatus, towns once famous in Phœnicia, are recorded to have met the same fate; and the vast promontory, called *Phlegium*, in Ethiopia, after a violent earthquake in the night-time, was not to be seen in the morning, the whole having disappeared, and the earth closed over it. These and many other histories, attested by the authors of greatest credit among the ancients, abundantly prove the fact in the earlier ages; and there have not been wanting too many instances of more modern date. Kircher's *Mund. Subter.* p. 77. See **EARTH** and **EARTHQUAKE**.

Abforus

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Abstinence.

ABSORUS, **APSORUS**, **ABSYRTIS**, **ABSYRTIDES**, **ABSYRTIDES**, **ABSYRTIS**, and **ABSYRTIUM**, (Strabo, Mela, Ptolemy); islands in the Adriatic, in the gulf of Carnero; so called from Absyrtus, Medea's brother, there slain. They are either one island or two, separated by a narrow channel, and joined by a bridge; and are now called *Cheerso* and *Osero*.

ABSTEMII, in church-history, a name given to such persons as could not partake of the cup of the eucharist on account of their natural aversion to wine. Calvinists allow these to communicate in the species or bread only, touching the cup with their lip; which, on the other hand, is by the Lutherans deemed a profanation.

ABSTEMIOUS, is properly understood of a person who refrains absolutely from all use of wine.

The history of Mr Wood, in the *Medic. Transf.* vol. ii. p. 261. art. 18. is a very remarkable exemplification of the very beneficial alterations which may be effected on the human body by a strict course of abstemiousness.

The Roman ladies, in the first ages of the republic, were all enjoined to be abstemious; and that it might appear, by their breath, whether or no they kept up to the injunction, it was one of the laws of the Roman civility, that they should kiss their friends and relations whenever they accosted them.

ABSTEMIUS (Laurentius) a native of Macerata, professor of belles lettres in Urbino, and librarian of duke Guido Ubaldo, under the pontificate of Alexander VI. He wrote, 1. Notes on most difficult passages of ancient authors. 2. *Hecatomythium*, i. e. A collection of an 100 fables; &c. which have been often printed with those of Æsop, Phædrus, Gabrius, Avienus, &c.

ABSTERGENT MEDICINES, those employed for resolving obstructions, concretions, &c. such as soap, &c.

ABSTINENCE, in a general sense, the act or habit of refraining from something which we have a propensity to or find pleasure in.—Among the Jews, various kinds of abstinence were ordained by their law. Among the primitive Christians, some denied themselves the use of such meats as were prohibited by that law, others looked upon this abstinence with contempt; as to which, St Paul gives his opinion, *Rom. xiv. 1—3*. The council of Jerusalem, which was held by the Apostles, enjoined the Christian converts to abstain from meats strangled, from blood, from fornication, and from idolatry. Abstinence, as prescribed by the gospel, is intended to mortify and restrain the passions, to humble our vicious natures, and by that means raise our minds to a due sense of devotion. But there is another sort of abstinence, which may be called *ritual*, and consists in abstaining from particular meats at certain times and seasons. It was the spiritual monarchy of the western world which first introduced this ritual abstinence; the rules of which were called *rogations*; but grossly abused from the true nature and design of fasting.—In England, abstinence from flesh has been enjoined by statute even since the reformation, particularly on Fridays and Saturdays, on vigils, and on all commonly called *fish-days*. The like injunctions were renewed under Q. Elizabeth: but at the same time it was declared, that this was done not out of motives of

religion, as if there were any difference in meats; but Abstinence. in favour of the consumption of fish, and to multiply the number of fishermen and mariners, as well as spare the stock of sheep. The great fast, says St Augustin, is to abstain from sin.

ABSTINENCE is more particularly used for a spare diet, or a slender parsimonious use of food, below the ordinary standard of nature. The physicians relate wonders of the effects of abstinence in the cure of many disorders, and protracting the term of life. The noble Venetian, Cornaro, after all imaginable means had proved vain, so that his life was despaired of at 40, recovered, and lived to near 100, by mere dint of abstinence; as he himself gives the account. It is indeed surprising to what a great age the primitive Christians of the east, who retired from the persecutions into the deserts of Arabia and Egypt, lived, healthful and cheerful, on a very little food. Cassian assures us, that the common rate for 24 hours was 12 ounces of bread, and mere water: with this St Anthony lived 105 years; James the Hermit 104; Arsenius, tutor of the Emperor Arcadius, 120; S. Epiphanius, 115; Simeon the Stylite, 112; and Romauld, 120. Indeed, we can match these instances of longevity at home. Buchanan writes, that one Laurence preserved himself to 140 by force of temperance and labour; and Spotswood mentions one Kentigern, afterwards called S. Mongah or Mungo, who lived to 185 by the same means. Other instances see under the article **LONGEVITY**.—Abstinence, however, is to be recommended only as it means a proper regimen; for in general it must have bad consequences when observed without a due regard to constitution, age, strength, &c. According to Dr Cheyne, most of the chronical diseases, the infirmities of old age, and the short lives of Englishmen, are owing to repletion; and may be either cured, prevented, or remedied by abstinence: but then the kinds of abstinence which ought to obtain, either in sickness or health, are to be deduced from the laws of diet and regimen.

Among the brute creation, we see extraordinary instances of long abstinence. The serpent-kind, in particular, bear abstinence to a wonderful degree. We have seen rattle-snakes that had subsisted many months without any food, yet still retained their vigour and fierceness. Dr Shaw speaks of a couple of cerastes (a sort of Egyptian serpents), which had been kept five years in a bottle close corked, without any sort of food, unless a small quantity of sand wherein they coiled themselves up in the bottom of the vessel may be reckoned as such: yet when he saw them, they had newly cast their skins, and were as brisk and lively as if just taken. But it is even natural for divers species to pass four, five, or six months every year, without either eating or drinking. Accordingly, the tortoise, bear, dormouse, serpent, &c. are observed regularly to retire, at those seasons, to their respective cells, and hide themselves, some in the caverns of rocks or ruins; others dig holes under ground; others get into woods, and lay themselves up in the clefts of trees; others bury themselves under water, &c. And these animals are found as fat and fleshy after some months abstinence as before.—Sir G. Ent * weighed his tortoise several years successively, at its going to earth in October, and coming *Transf.* out again in March; and found, that, of four pounds ^{n^o 194} four

Abstinence four ounces, it only used to lose about one ounce.

Abstract. —Indeed, we have instances of men passing several months as strictly abstinent as other creatures. In particular, the records of the Tower mention a Scotchman imprisoned for felony, and strictly watched in that fortress for six weeks: in all which time he took not the least sustenance; for which he had his pardon. Numberless instances of extraordinary abstinence, particularly from morbid causes, are to be found in the different periodical Memoirs, Transactions, Ephemerides, &c. — It is to be added, that, in most instances of extraordinary human abstinence related by naturalists, there were said to have been apparent marks of a texture of blood and humours, much like that of the animals above mentioned. Though it is no improbable opinion, that the air itself may furnish something for nutrition. It is certain, there are substances of all kinds, animal, vegetable, &c. floating in the atmosphere, which must be continually taken in by respiration. And that an animal body may be nourished thereby, is evident in the instance of vipers; which if taken when first brought forth, and kept from every thing but air, will yet grow very considerably in a few days. So the eggs of lizards are observed to increase in bulk, after they are produced, though there be nothing to furnish the increment but air alone; in like manner as the eggs or spawn of fishes grow and are nourished with the water. And hence, say some, it is that cooks, turnspit-dogs, &c. though they eat but little, yet are usually fat. See **FASTING**.

ABSTINENTS, or **ABSTINENTES**, a set of heretics that appeared in France and Spain about the end of the third century. They are supposed to have borrowed part of their opinions from the Gnostics and Manicheans, because they opposed marriage, condemned the use of flesh meat, and placed the Holy Ghost in the class of created beings. We have, however, no certain account of their peculiar tenets.

ABSTRACT, in a general sense, any thing separated from something else.

ABSTRACT Idea, in metaphysics, is a partial idea of a complex object, limited to one or more of the component parts or properties, laying aside or abstracting from the rest. Thus, in viewing an object with the eye, or recollecting it in the mind, we can easily abstract from some of its parts or properties, and attach ourselves to others: we can attend to the redness of a cherry, without regard to its figure, taste, or consistence. See **ABSTRACTION**.

ABSTRACT Terms, words that are used to express abstract ideas. Thus beauty, ugliness, whiteness, roundness, life, death, are abstract terms.

ABSTRACT Numbers, are assemblages of units, considered in themselves without denoting any particular and determined particulars. Thus 6 is an abstract number, when not applied to any thing; but, if we say 6 feet, 6 becomes a concrete number. See the article **NUMBER**.

ABSTRACT Mathematics, otherwise called *Pure Mathematics*, is that which treats of magnitude or quantity, absolutely and generally considered, without restriction to any species of particular magnitude; such are Arithmetic and Geometry. In this sense, abstract mathematics is opposed to mixed mathematics; wherein simple and abstract properties, and the relations of quantities primitively considered in pure mathematics,

are applied to sensible objects, and by that means become intermixed with physical considerations; such are Hydrostatics, Optics, Navigation, &c.

ABSTRACT, in literature, a compendious view of any large work; shorter and more superficial than an abridgment.

ABSTRACTION, in general, the art of abstracting, or the state of being abstracted.

ABSTRACTION, in metaphysics, the operation of the mind when occupied by abstract ideas. A large oak fixes our attention, and abstracts us from the shrubs that surround it. In the same manner, a beautiful woman in a crowd, abstracts our thoughts, and engrosses our attention solely to herself. These are examples of real abstraction: when these, or any others of a similar kind, are recalled to the mind after the objects themselves are removed from our sight, they form what is called *abstract ideas*, or the mind is said to be employed in abstract ideas. But the power of abstraction is not confined to objects that are separable in reality as well as mentally: the size, the figure, the colour of a tree are inseparably connected, and cannot exist independent of each other; and yet we can mentally confine our observations to any one of these properties, neglecting or abstracting from the rest.

Abstraction is chiefly employed these three ways. First, When the mind considers any one part of a thing, in some respect distinct from the whole; as a man's arm, without the consideration of the rest of the body. Secondly, When we consider the *mode* of any substance, omitting the substance itself; or when we separately consider several modes which subsist together in one subject. This abstraction the geometers make use of when they consider the length of a body separately, which they call *a line*, omitting the consideration of its breadth and thickness. Thirdly, It is by abstraction that the mind forms general or universal ideas; omitting the modes and relations of the particular objects whence they are formed. Thus, when we would understand a thinking being in general, we gather from our self-consciousness what it is to think; and, omitting those things which have a particular relation to our own minds, or to the human mind, we conceive a thinking being in general.

Ideas formed in this manner, which are what we properly call *abstract ideas*, become general representatives of all objects of the same kind; and their names applicable to whatever exists conformable to such ideas. Thus the idea of colour that we receive from chalk, snow, milk, &c. is a representative of all of that kind; and has a name given it, *whiteness*, which signifies the same quality wherever found or imagined.

ABSTRUSE, something deep, hidden, concealed, or far removed from common apprehensions, and therefore not easily understood; in opposition to what is obvious and palpable. Thus metaphysics is an abstruse science; and the doctrine of fluxions, and the method *de maximis et minimis*, are abstruse points of knowledge.

ABSURD, an epithet applied to any thing that opposes the human apprehension and contradicts a manifest truth. Thus, it would be absurd to say that 6 and 6 make only 10, or to deny that twice 6 make 12. When the term *absurd* is applied to actions, it has the same import as *ridiculous*.

ABSYN-

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Abus.

ABSYNTHIUM. See ABSINTHIUM.

ABSYRTUS, in the Heathen mythology, the son of Æta and Hypsea, and the brother of Medea. The latter running away with Jason, after her having assisted him in carrying off the golden fleece, was pursued by her father; when, to stop his progress, she tore Absyrtus in pieces, and scattered his limbs in his way.

ABTHANES, a title of honour used by the ancient inhabitants of Scotland, who called their nobles *thanes*, which in the old Saxon signifies *king's ministers*; and of these the higher rank were styled *abthanes*, and those of the lower *under thanes*.

ABUCCO, ABOCO, or ABOCCHI, a weight used in the kingdom of Pegu. One abucco contains $12\frac{1}{2}$ teccalis; two abuccos make a giro or agire; two giri, half a hiza; and a hiza weighs an hundred teccalis; that is, two pounds five ounces the heavy weight, or three pounds nine ounces the light weight of Venice.

ABUKESO, in commerce, the same with ASLAN.

ABULFARAGIUS (Gregory), son to Aaron a physician, born in 1226, in the city of Malatia, near the source of the Euphrates in Armenia. He followed the profession of his father; and practised with great success, numbers of people coming from the most remote parts to ask his advice. However, he would hardly have been known at this time, had his knowledge been confined to physic: but he applied himself to the study of the Greek, Syriac, and Arabic languages, as well as philosophy and divinity; and he wrote a history which does honour to his memory. It is written in Arabic, and divided into dynasties. It consists of ten parts, being an epitome of universal history from the creation of the world to his own time. Dr Pocock published it with a Latin translation in 1663; and added, by way of supplement, a short continuation relating to the history of the eastern princes.

ABUNA, the title given to the archbishop or metropolitan of Abyssinia. See ABYSSINIA.

ABUNDANT NUMBER, in arithmetic, is a number, the sum of whose aliquot parts is greater than the number itself. Thus the aliquot parts of 12, being 1, 2, 3, 4, and 6, they make, when added together, 16. An abundant number is opposed to a *deficient* number, or that which is greater than all its aliquot parts taken together; as 14, whose aliquot parts are, 1, 2, and 7, which make no more than 10: and to a *perfect* number, or one to which its aliquot parts are equal; as 6, whose aliquot parts are 1, 2, and 3.

ABUNDANTIA, a Heathen divinity, represented in ancient monuments under the figure of a woman with a pleasing aspect, crowned with garlands of flowers, pouring all sorts of fruit out of a horn which she holds in her right hand, and scattering grain with her left, taken promiscuously from a sheaf of corn. On a medal of Trajan, she is represented with two cornucopie.

ABU SAID (Ebn Aljaptu), sultan of the Moguls, succeeded his father anno 717 of the hegira. He was the last monarch of the race of Jenghizkhan; and after his death, which happened the same year that Tamerlane was born, the empire was made a scene of blood and desolation.

ABUS (anc. geog.), a river of Britain, formed by the confluence of the Ure, the Derwent, Trent, &c. falling into the German Sea between Yorkshire and Lincolnshire, and forming the mouth of the Humber.

ABUSE, an irregular use of a thing, or the introducing something contrary to the true intention thereof. In grammar, to apply a word *abusively*, or in an *abusive* sense, is to misapply or pervert its meaning. — A permutation of benefices, without the consent of the bishop, is termed *abusive*, and consequently null.

ABUTILON, in botany, the trivial name of several species of the sida. See SIDA.

ABYDOS (anc. geog.), anciently a town built by the Milesians in Asia, on the Hellespont, where it is scarce a mile over, opposite to Sestos on the European side. Now both called the *Dardanelles*. Abydos lay midway between Lampacus and Ilium, famous for Xerxes's bridge (Herodotus, Virgil); and for the loves of Leander and Hero (Musæus, Ovid); celebrated also for its oysters (Ennius, Virgil). The inhabitants were a soft, effeminate people, given much to detraction; hence the proverb, *Ne temere Abydum*, when we would caution against danger (Stephanus).

ABYDOS (anc. geog.), anciently an inland town of Egypt, between Ptolemais and Diospolis Parva, towards Syrene; famous for the palace of Memnon and the temple of Osiris. A colony of Milesians; (Stephanus). It was the only one in the country into which the fingers and dancers were forbid to enter.

This city, reduced to a village under the empire of Augustus, now presents to our view only an heap of ruins without inhabitants; but to the west of these ruins is still found the celebrated tomb of Ismandes. The entrance is under a portico 60 feet high, and supported by two rows of massy columns. The immovable solidity of the edifice, the huge masses which compose it, the hieroglyphics it is loaded with, stamp it a work of the ancient Egyptians. Beyond it is a temple 300 feet long and 145 wide. Upon entering the monument we meet with an immense hall, the roof of which is supported by 28 columns 60 feet high and 19 in circumference at the base. They are 12 feet distant from each other. The enormous stones that form the ceiling, perfectly joined and incruited, as it were, one in the other, offer to the eye nothing but one solid platform of marble 126 feet long and 26 wide. The walls are covered with hieroglyphics. One sees there a multitude of animals, birds, and human figures with pointed caps on their heads, and a piece of stuff hanging down behind, dressed in loose robes that come down only to the waist. The sculpture, however, is clumsy; the forms of the body, the attitudes and proportions of the members, ill observed. Amongst these we may distinguish some women suckling their children, and men presenting offerings to them. Here also we meet with the divinities of India. Monsieur Chevalier, formerly governor of Chandernagore, who resided 20 years in that country, carefully visited this monument on his return from Bengal. He remarked here the gods *Jag-grenat*, *Gonez*, and *Vechnou* or *Wissnou*, such as they are represented in the temples of Indostan. — A great gate opens at the bottom of the first hall, which leads to an apartment 46 feet long by 22 wide. Six square pillars support the roof of it; and at the angles are the doors of four other chambers, but so choaked up with rubbish that they cannot now be entered. The last hall, 64 feet long by 24 wide, has stairs by which one descends into the subterraneous apartments of this grand edifice. The Arabs, in searching after treasure, have piled

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piled up heaps of earth and rubbish. In the part we are able to penetrate, sculpture and hieroglyphics are discoverable as in the upper story. The natives say that they correspond exactly with those above ground, and that the columns are as deep in the earth as they are lofty above ground. It would be dangerous to go far into those vaults; for the air of them is so loaded with a mephitic vapour, that a candle can scarce be kept burning in them. Six lions heads, placed on the two sides of the temple, serve as spouts to carry off the water. You mount to the top by a staircase of a very singular structure. It is built with stones incrusting in the wall, and projecting six feet out; so that being supported only at one end, they appear to be suspended in the air. The walls, the roof, and the columns of this edifice, have suffered nothing from the injuries of time; and did not the hieroglyphics, by being corroded in some places, mark its antiquity, it would appear to have been newly built. The solidity is such, that unless people make a point of destroying it, the building must last a great number of ages. Except the colossal figures, whose heads serve as an ornament to the capitals of the columns, and which are sculptured *in relief*, the rest of the hieroglyphics which cover the inside are carved in stone. To the left of this great building we meet with another much smaller, at the bottom of which is a sort of altar. This was probably the sanctuary of the temple of Osiris.

ABYLA (Ptolemy, Mela); one of Hercules's pillars on the African side, called by the Spaniards *Sier-ra de las Monas*, over against Calpe in Spain, the other pillar, supposed to have been formerly joined, but separated by Hercules, and thus to have given entrance to the sea now called the *Mediterranean*: the limits of the labours of Hercules (Pliny).

ABYSS, in a general sense, denotes something profound, and, as it were, bottomless. The word is originally Greek, *αβυσσος*; compounded of the primitive *α*, and *βυσσο*, *q. d.* without a bottom.

ABYSS, in a more particular sense, denotes a deep mass or fund of waters. In this sense, the word is particularly used, in the Septuagint, for the water which God created at the beginning with the earth, which encompassed it round, and which our translators render by *deep*. Thus it is that darkness is said to have been on the face of the abyss.

ABYSS is also used for an immense cavern in the earth, wherein God is supposed to have collected all those waters on the third day; which, in our version, is rendered the *seas*, and elsewhere the *great deep*. Dr Woodward, in his *Natural History of the Earth*, asserts, That there is a mighty collection of waters inclosed in the bowels of the earth, constituting a huge orb in the interior or central parts of it; and over the surface of this water he supposes the terrestrial strata to be expanded. This, according to him, is what Moses calls the *great deep*, and what most authors render the *great abyss*. The water of this vast abyss, he alleges, does communicate with that of the ocean, by means of certain hiatuses or chasms passing betwixt it and the bottom of the ocean: and this and the abyss he supposes to have one common centre, around which the water of both is placed; but so, that the ordinary surface of the abyss is not level with that of the ocean, nor at so great a distance from the centre as the other,

it being for the most part restrained and depressed by the strata of earth lying upon it: but wherever those strata are broken, or so lax and porous that water can pervade them, there the water of the abyss ascends; fills up all the clefts and fissures into which it can get admittance; and saturates all the interstices and pores of the earth, stone, or other matter, all around the globe, quite up to the level of the ocean.

The existence of an abyss, or receptacle of subterraneous waters, is controverted by Camerarius*; and defended by Dr Woodward chiefly by two arguments: the first drawn from the vast quantity of water which covered the earth in the time of the deluge; the second, from the consideration of earthquakes, which he endeavours to show are occasioned by the violence of the waters in this abyss. A great part of the terrestrial globe has been frequently shaken at the same moment; which argues, according to him, that the waters, which were the occasion thereof, were coextended with that part of the globe. There are even instances of universal earthquakes; which (says he), show, that the whole abyss must have been agitated: for so general an effect must have been produced by as general a cause, and that cause can be nothing but the subterraneous abyss†.

To this abyss also has been attributed the origin of springs and rivers; the level maintained in the surfaces of different seas; and their not overflowing their banks. To the effluvia emitted from it, some even attribute all the diversities of weather and change in our atmosphere‡. Ray||, and other authors, ancient as well as modern, suppose a communication between the Caspian Sea and the ocean by means of a subterranean abyss: and to this they attribute it that the Caspian does not overflow, notwithstanding the great number of large rivers it receives, of which Kempfer reckons above 50 in the compass of 60 miles; tho', as to this, others suppose that the daily evaporation may suffice to keep the level.

The different arguments concerning this subject may be seen collected and amplified in *Cockburn's Inquiry into the Truth and Certainty of the Mosaic Deluge*, p. 271, &c. After all, however, this amazing theory of a central abyss is far from being demonstrated: it will perhaps in several respects appear inconsistent with sound philosophy, as well as repugnant to the phenomena of nature. In particular, if we believe any thing like elective attraction to have prevailed in the formation of the earth, we must believe that the separation of the chaos proceeded from the union of similar particles. It is certain that rest is favourable to such operations of nature. As, therefore, the central parts of the earth were more immediately quiescent than those remote from the centre, it seems absurd to suppose that the heavier and denser bodies gave place to the more light and fluid; that the central part should consist of water only, and the more superficial part of a crust or shell. Vid. *Whitehurst's Inquiry into the original Formation of the Strata*, &c. See DE-LUGE.

ABYSS is also used to denote hell; in which sense the word is synonymous with what is otherwise called *Barathrum*, *Erebus*, and *Tartarus*; in the English Bible, the *bottomless pit*. The unclean spirits expelled by

Abyfs.

* Dissert. Taur. Acta. Erud. supp. tom. vi. p. 24.

† Hist. of the Earth. Journal de Scavans, tom. lviii. p. 393. Memoirs of Literature, tom. viii. p. 101, &c. Holloway, Introd. to Woodward's Hist. of the Earth. Acta Erud. 1727, p. 313. || Physico-Theol. Disc. ii. c. 2.

Disc. ii. c. 2. p. 76.

Abyfs,
Abyssinia.

Christ, begged, *ne imperaret ut in abyssum irent*, according to the vulgate; *αβυσσον*, according to the Greek. Luke viii. 31. Rev. ix. 1.

ABYSS is more particularly used in antiquity, to denote the temple of Proserpine. It was thus called on account of the immense fund of gold and riches deposited there; some say, hid under ground.

ABYSS is also used in heraldry to denote the centre of an escutcheon. In which sense, a thing is said to be bore in abyfs, *en abyfme*, when placed in the middle of the shield, clear from any other bearing: He bears azure, a flower-de-lis, in abyfs.

ABYSSINIA, by some called *Higher Ethiopia*, and by the Arabians *Al Habash*, is bounded on the north by Nubia; on the east, by the Arabic Gulph or Red Sea, and the kingdom of Adel; on the south, by the kingdoms of Ajan, Alabo, and Gingiro; and on the west, by the kingdom of Goram, and part of Gingiro; and is divided into a great number of provinces. The principal river is the Nile, which has its source in this country; and the most considerable lake, that of Dambea, which discharges itself into the Nile, is about 700 miles in length, and 90 in breadth. The air is pretty temperate in the mountains, and therefore their towns and strong holds are generally placed on them; but in the valleys it is hot and suffocating. The soil and face of the country is various. In some places there are nothing but rocks and profound caverns: in others, especially where there are rivers, the land is exceedingly fruitful; and the banks of these streams are bordered with flowers of various kinds, many of which are unknown in Europe. The torrents in the rainy season wash a great deal of gold from the mountains. This season begins in May, when the sun is vertical, or directly over their heads, and ends in September.—The country produces a great variety of animals, both tame and wild, such as lions, tigers, rhinoceroses, leopards, elephants, monkeys, stags, deer; horses, camels, dromedaries, goats, cows, sheep; likewise ostriches, with a vast variety of other birds. In the rivers are crocodiles and the hippopotamus. Travellers mention also a peculiar kind of bees, small, black, and without a sting, which hive in the earth, and make honey and wax that are extremely white. The country is greatly infested with locusts, which devour every thing that is green wherever they come.

The inhabitants are Moors, Pagans, Jews, and Christians. The last was the reigning and established religion when Father Lobo visited this country in 1624. This diversity of people and religion is the reason that the kingdom, in different parts, is under different forms of government, and that their laws and customs are extremely various. Some of the people neither sow their lands nor improve them; but live on milk and flesh, and encamp like the Arabs, without any settled habitation. In some places they practise no rites of worship, though they believe that there dwells in the regions above a Being who governs the world: This deity they call *Oul*. In those parts where Christianity is professed, it is so corrupted with superstitious errors, and so mingled with ceremonies borrowed from the Jews, that little beside the name of Christianity is to be found among them. (See the next article.)—They have two harvests in the year; one in winter, which begins in May, and lasts, with great rigour, through the months of

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July, August, and September; and the other in spring. Every man who has a thousand cows saves once a-year a day's milk, and makes a bath for his friends; so that to give an idea of a man's wealth, their common expression is, *he bathes so many times a-year*. Their males marry about ten years old, and their females younger. Their marriage tie is so loose, that they part whenever they find that they cannot live agreeably together.

Besides the large towns, there are a great number of villages, which in some places are so thick sown, that they look like one continued town: the houses are very mean, being but one story high, and built of straw, earth, and lime. In most of the towns the houses are separated by hedges, which are always green, and mixed with flowers and fruit-trees at a certain distance from each other, which affords an agreeable prospect.—The government is monarchical. The sovereign has the title of *Negus*, and is an absolute prince. When he is in camp, the tents are so regularly disposed as to have the appearance of a city; and there is a captain over every division, to prevent disorders, and to execute justice.

The Abyssinians in general are of an olive complexion, tall, graceful, and well featured. Those who are neither mechanics nor tradesmen (which few of them are), nor tillers of the ground, are enured to bear arms, which are a head-piece, a buckler, a coat of mail, bows and arrows, darts, pikes capped with iron at both ends, a sling, and a sword: they have very few fire-arms, and those were introduced by the Portuguese. The habit of persons of quality is a fine silken vest, or fine cotton, with a kind of scarf. The citizens have the same habit, only coarser. The common people have nothing but a pair of cotton drawers, and a scarf which covers the rest of their body. The women are of a healthy constitution, active, and moderately handsome, having neither flat noses nor thick lips like the negroes; and nature is so friendly, that they stand in little need of midwives, which is indeed the case of most countries in the torrid zone. They appear in public as in Europe, without being forbid the conversation of the men as among the Mahometans. Princesses of the royal blood are not permitted to marry foreigners: and when they take the air, they go in great state, with 400 or 500 women attendants. Their language is the Ethiopic, which bears a great affinity with the Arabic; but particular provinces have a different dialect.

Manufactures are almost wholly wanting in this country; and the few trades which they have amongst them are always conveyed from the father to the children. They seem indeed by their churches, and other ruined places, to have had a knowledge of architecture. But the workmen were sent for from other countries, and were forced to do all themselves; so that when these fabrics were reared, especially the imperial palace built by Peter Pais, a Portuguese architect, the people flocked from all parts of Ethiopia to view it, and admired it as a new wonder of the world.—Gold, silver, copper, and iron, are the principal ores with which their mines abound in this extensive part of Africa: but not above one third part is made use of by way of merchandize, or converted into money; of which they have little or no use in Abyssinia. They cut their gold indeed into small pieces for the pay of their troops, and for expenses of the court, which is but a modern custom among them;

Abyssinia.

Abyssinia. them; the king's gold, before the end of the 17th century, being laid up in his treasury in ingots, with intent to be never carried out, or never used in any thing but vessels and trinkets for the service of the palace. In the lieu of small money, they make use of rock salt as white as snow and as hard as stone. This is taken out of the mountain of Lafta, and put into the king's warehouses; where it is reduced into tablets of a foot long, and three inches broad, ten of which are worth about a French crown. When they are circulated in trade, they are reduced into still smaller pieces, as occasion requires. This salt is also applied to the same purpose as common sea-salt. With this mineral salt they purchase pepper, spices, and silk stuffs, which are brought to them by the Indians, in their ports in the Red Sea. Cardamums, ginger, aloes, myrrh, cassia, civet, ebony-wood, ivory, wax, honey, cotton, and linsens of various sorts and colours, are merchandises which may be had from Abyssinia; to which may be added sugar, hemp, flax, and excellent wines, if these people had the art of preparing them. It is affirmed there are in this country the finest emeralds that are any where to be found; and, though they are found but in one place, they are there in great quantities, and some so large and so perfect as to be of almost inestimable value. Their greatest part of the merchandises above mentioned, are more for foreign than inland trade. The domestic commerce consists chiefly in salt, honey, buck-wheat, grey pease, citrons, oranges, lemons, and other provisions, with fruits and herbage necessary for the support of life. Those places that the Abyssinian merchants frequent the most, who dare venture to carry their commodities by sea themselves, are Arabia Felix, and the Indies, particularly Goa, Cambaye, Bengal, and Sumatra. With regard to their ports on the Red Sea, to which foreign merchants commonly resort, the most considerable are those of Mette, Azum, Zajalla, Maga, Dazo, Patea, and Brava. The trade of the Abyssinians by land is inconsiderable. There are, however, bands of them who arrive yearly at Egypt, particularly at Cairo, laden with gold dust, which they bring to barter for the merchandises of that country, or of Europe, for which they have occasion. These caravans or caravans, if we may be allowed thus to call a body of 40 or 50 poor wretches who unite together for their mutual assistance in their journey, are commonly three or four months in their route, traversing forests and mountains almost impassible, in order to exchange their gold for necessaries for their families, and return immediately with the greatest part of the merchandise on their backs. Frequently the Jews or Egyptians give them large credit; which may seem surprising, as they are beyond recourse if they should fail of payment. But experience has shown, that they have never abused the confidence reposed in them; and even in the event of death, their fellow-travellers take care of the effects of the deceased for the benefit of their families, but in the first place for the discharge of those debts contracted at Cairo.— It remains only to be observed, that one of the principal branches of trade of the Abyssines is that of slaves; who are greatly esteemed in the Indies and Arabia for the best, and most faithful, of all that the other kingdoms of Africa furnish. The Indian and Arabian merchants frequently substitute them as their factors; and,

VOL. I. Part I.

Abyssinia. on account of their good services and integrity, not only often give them their liberty, but liberally reward them.

Into this part of the globe the admission of travellers has been supposed extremely difficult, and their return from thence almost impracticable. A Scotch gentleman, however, of family and fortune, James Bruce, Esq; of Kinnaird, is known not only to have entered that country, but to have resided in it several years, and returned safe home, bringing with him many great curiosities. Soon after his return, the following notice was given by the Count de Buffon in an advertisement prefixed to the 3d volume of his History of Birds: "A new aid which I have received, and which I am anxious to announce to the public, is the free and generous communication which I had of the drawings and observations of James Bruce, Esq; of Kinnaird, who returning from Numidia, and the interior parts of Abyssinia, stopt in my house for several days, and made me a partaker of the knowledge which he had acquired in a tour no less fatiguing than hazardous. It filled me with the utmost astonishment to view the numerous drawings which he had made and coloured himself. He possesses the most perfect representations and descriptions of the birds, fishes, plants, edifices, monuments, dresses, arms, &c. of different nations, all of them objects worthy of knowledge. Nothing has escaped his curiosity, and his talents have been proportioned to it. The English government will without doubt take proper measures for the publication of his work. That respectable nation, which has given a lead to all others in discoveries of every kind, will not fail to add to its glory, by speedily communicating to the world at large, those of this excellent traveller, who, not contented with accurate description of nature, has made many important observations on the culture of different kinds of grains; on the navigation of the Red Sea; on the course of the Nile, from its mouth to its source, which he has been the first to discover; and on different particulars which may be of the highest utility to commerce and agriculture: those great arts which are but little known and ill cultivated; though on these alone the superiority of one nation over another depends, and for ever will depend."

It is much to be regretted, that after so long an interval this gentleman's discoveries have not yet made their appearance. The delay has given rise to various speculations. Doubts have even been entertained concerning the credibility of the reports that have transpired or been gathered from his conversation. His honour and abilities, however, are too extensively known to be affected by such injurious insinuations. That he hath great talents for the information of his readers, appears by his dissertation on the Theban harp*, which * See the Dr Burney hath inserted in the first volume of his article History of Music, and in which are also mentioned several of the Abyssinian instruments. Mr Bruce, moreover, is said to have a great facility in learning languages, and talents for drawing; nor perhaps was any other traveller furnished with so large and scientific an apparatus of instruments. Add to all this, that he is possessed of a spirit and enterprise not easily to be equalled. The speedy production, therefore, of so interesting an account as he is capable of giving, of this

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Abyssinia. almost unfrequented part of Africa, cannot but still be earnestly wished for. In the mean time, the following authentic anecdotes will not, it is presumed, be unacceptable, nor appear foreign to the present article.

Mr Bruce was appointed consul to Algiers, where he continued till 1765. In June 1764, he requested leave of absence from the secretary of state for the southern department, in order to make some drawings of antiquities near Tunis.

In Mr Bruce's last letter from Algiers to the same secretary (dated December 29. 1764), he alludes to another leave of absence, which he had likewise requested, that he might visit parts of the African continent. He explains himself no further in this letter; but it is believed that he proceeded considerably to the southward of Algiers, and made those very capital drawings of remains of Roman architecture which many have seen since his return to Britain. Before he set out for Algiers, he informed some of his friends, that the making such excursions for these interesting purposes was his principal inducement for accepting the consulship.

How long he continued in Africa, the present writer has not had the opportunity of procuring information; but having intentions afterwards of visiting Palmyra, he was shipwrecked on the coast of Tunis, and plundered of every thing by the barbarous inhabitants.

The most distressing part of the loss was probably that of his instruments, so necessary to a scientific traveller; and though he afterwards procured some of these, yet others (particularly a quadrant) could not be recovered. Mr Bruce, however, determining to repair this loss as soon as possible from France, so much nearer to him than England, was so fortunate as to be provided with a time-piece and quadrant from that quarter. Upon this occasion Louis XV. presented him with an iron quadrant of four feet radius, as he had probably represented to the academy of sciences his want of such an instrument whilst he should be in Abyssinia: Mr Bruce brought back with him to England this cumbrous fellow-traveller, and, having put upon it an inscription to the following purport, is said to have presented it to the university of Glasgow: "With this instrument, given by the king of France, Louis XV. Mr Bruce proceeded to the sources of the Nile, it being carried on foot, upon mens shoulders, over the mountains of Abyssinia." This information was received from that eminent maker of instruments Mr Nairne.

Where and when Mr Bruce received the French instruments is not known; but as he was still bent on visiting Abyssinia, he gave a commission to Mr W. Ruffel, F. R. S. for a reflecting telescope, made by *Bird* or *Short*; a watch with a hand to point seconds; and the newest and most complete English astronomical tables: all of which were to be sent to Mr Fremaux, and forwarded to him at Alexandria before August. On the 29th of March 1768, Mr Bruce was at Sidon on the coast of Syria, and wrote to Mr Ruffel from thence for the following additional instruments, viz. a twelve-feet reflecting telescope, to be divided into pieces of three feet, and joined with screws; two thermometers, and two portable barometers. Mr Bruce moreover informed Mr Ruffel, that he was going into a

country (viz. Abyssinia) from which few travellers had returned; and wished Mr Ruffel, or his philosophical friends, would send him their desiderata, as he was entirely at their service. Mr Bruce added, that if he could not obtain admission into Abyssinia, he still would do his best in the cause of science on the eastern coast of the Red sea.

As Mr Bruce had directed the instruments to be ready for him at Alexandria by the beginning of August 1768, it is probable that he reached Cairo about that time; from whence he proceeded to Abyssinia, by way of JEDDA, MAZAVA, and ARQUITO.

It is supposed that Mr Bruce did not continue long at Jedda, as he is said to have explored the coast on the east side as low as Mocha, during which drawings were taken of many curious fish in the Red Sea. Mr Bruce must also have entered Abyssinia, either at the latter end of 1768, or the very beginning of 1769, as he made an observation in that part of Africa on the 15th of January of that year.

In this perilous enterprise he was accompanied by a Greek servant (named *Michael*), and an Italian painter, who probably assisted in the numerous articles which might deserve representation, and who died of a flux before Mr Bruce's return to Cairo in 1773. Mr Bruce must at times also have been assisted by many others, as his instruments, apparatus for drawings, and other necessaries, from their weight and bulk could not be easily transported from place to place, and perhaps required beasts of burden. To these likewise must be added several medicines, which enabled him to perform cures on the inhabitants, and probably occasioned the good reception he afterwards met with.

Such other particulars as happened to Mr Bruce, during his long residence in this unfrequented country, must be left to his own superior narrative; and it shall suffice, therefore, only to state, that he made a large number of observations to fix the situations of places, out of which 31 have been examined and computed by the astronomer royal. The first of these observations was made on the 10th of January 1769, and the last on the 5th of October 1772, from 30 to 38 degrees of east longitude from Greenwich, and from 12 to 28 degrees of north latitude. It need scarcely be said, therefore, that these observations which include so large an extent of almost unknown country, must prove a most valuable addition to geography; and the more so, because the Portuguese, who first visited Abyssinia, give neither longitude nor latitude of any place in that empire; and Poncet only two latitudes, viz. those of Sennar and Giesum.

As Mr Bruce made the last of his observations on the 5th of October 1772, it is probable that he might then be on his return to Cairo, through Nubia and Upper Egypt, where he arrived on the 15th of January 1773, after an absence of more than four years; bringing back with him his Greek servant named Michael.

Mr Bruce continued at Cairo four months, during which time he had daily intercourse with Mr Antes; the substance of a letter from whom will contain the principal confutation of Baron Tott, and others, who have been incredulous with regard to Mr Bruce's expected narrative.

Mr

Abyssinia. Mr Antes was born of German parents, who were possessed of lands in the back settlements of Pennsylvania; and having showed early abilities as a mechanic, removed to Europe, where he distinguished himself in the art of watch-making, which he learned without apprenticeship. Being a member of the church known by the name of *Unitas Fratrum*, and commonly called *Moravian*, he wished to be employed in their missions, and more especially that of the same persuasion established at Cairo, who always have desired to procure opportunities of instructing the Abyssinians.

Mr Bruce had left Cairo fifteen months before Mr Antes came there; and the intercourse, therefore, between them first took place on Mr Bruce's return in 1773.

Having given this account of Mr Bruce and Mr Antes's being first known to each other, we shall state the substance of some information received from the latter, who is now established at Fulneck near Leeds, after having resided eleven years at Cairo.

"That Mr Bruce left Cairo in 1768, and proceeded thence by way of Jedda, Mazava, and Arquito, into Abyssinia.

"That in 1771, a Greek came from Gondar (the capital) in Abyssinia, who had a draught from Mr Bruce on a French merchant at Cairo (named *Rose*) for some hundreds of German crowns, which were paid immediately. This draught was accompanied by a letter from Mr Bruce, and was the first time that he had been heard of at Cairo since his departure in 1768.

"That after Mr Bruce's return to Cairo in 1773, Mr Antes saw a young Armenian and his father (who came likewise from Gondar) at Mr Pini's, an Italian merchant of Cairo, where they and Mr Bruce conversed in the Abyssinian language, and seemed glad to meet him again.

"That Mr Bruce returned to Cairo from Abyssinia by way of Nubia and Upper Egypt; which can be fully attested by the Franciscan friars who are established at Isne near Asyuwan, which latter is the highest town of Upper Egypt.

"That during Mr Bruce's stay at Cairo, which was not less than four months, no day passed without their seeing each other; which gave Mr Antes frequent opportunities of inquiring with regard to Abyssinia, concerning which he was particularly interested from a reason before stated.

"That Mr Antes likewise frequently conversed with Michael, Mr Bruce's Greek servant; who is stated to

have by no means had a lively imagination, and who always agreed with the circumstances mentioned by his master, and more particularly in relation to their having visited the sources of the Nile; which the Baron Tott doubts of, from having had a conversation with this same Greek servant.

Mr Antes adds, "That Baron Tott staid but a few days at Cairo; and, from his short residence in that country, hath given several erroneous accounts relative to Egypt. Mr Antes, on the other hand, had almost daily conversations with Michael for several years, and often in relation to the sources of the Nile."

Lastly, "That after Mr Bruce left Cairo, Mr Antes had conversed with others who had known Mr Bruce in Abyssinia, and that he was there called *Maalim Jakube*, or Mr James."

After this state of facts, it is conceived that no one can entertain a reasonable doubt with regard to Mr Bruce's not only having visited, but resided long in Abyssinia; though it is remarkable that the Jesuits expressed the same doubts in relation to Poncet, who had continued there nearly as long as Mr Bruce. Poncet happened to be a layman; and the Jesuits, perhaps, would not approve of any narrative that did not come from father Benevent, who accompanied Poncet to Abyssinia, but unfortunately died there (a).

Driven, however, from this hold, the objectors will possibly retain their incredulity as to many particulars to be related.

The first of these is, the having visited the sources of the Nile; "which, from classical education, we cannot easily believe, as they were unknown to the ancients, though they had so great curiosity with regard to this discovery."

Many things, however, have been accomplished by travellers in modern times, which the ancients never could achieve, and which may be attributed to their want of enterprise (as travellers at least), of languages, and lastly the not being able to procure credit when in a distant country. Mr Bruce could not have continued so long as he did in Abyssinia, unless he had drawn from Gondar upon a merchant established at Cairo.

The difficulty, however, with regard to reaching the sources of the Nile, arises principally from the uncivilized state of Abyssinia, unless the traveller hath a proper introduction (b). When once this is procured, all difficulties seem to cease, as we find by Lobo's (c) account of this same discovery, and likewise by Pon-

E 2

cet's

(a) It must be admitted, however, that we owe to the zeal of the Jesuits the best accounts we have both of China and Paraguay. Few laymen have been actuated so strongly for the promotion of geography and science as Mr Bruce; and we must therefore (upon the order of Jesuits being abolished) look up chiefly to the missionaries from the church of the *Unitas Fratrum*, who, though differing so totally in other respects, seem to have an equal ardour with the Jesuits for instructing the inhabitants of countries unfrequented by Europeans. Such missions are already established in West Greenland, the coast of Labrador, N. Lat. 56. the back settlements of Carolina and Pennsylvania, in India, Bengal, and the Nicobar islands. Those established on the coast of Labrador send over yearly meteorological journals, which are communicated to the Royal Society. As for the dispute between Poncet and Maillet the French consul at Cairo, see *Mod. Univ. Hist.* vol. 6.

(b) The professing the knowledge of medicine was Poncet's introduction, and seems to have been that of Mr Bruce. Even in our own civilized country, how are quacks and mountebanks resorted to? And what an impression must Mr Bruce, with his magnificent and scientific apparatus, have made upon the inhabitants of such a country as Abyssinia?

(c) In Father Telles's compilation. See also Ludolf, who describes the sources from Gregory, who was a native of Abyssinia. Father Payz was the first who visited them, A. D. 1622. His account of this is said to be

Abyssinia. cet's narrative, who was prevented by illness from visiting the very spot, but hath given an ample relation from an Abyssinian who had often been there. Poncet, moreover, had obtained leave from the emperor to make this journey, which he states as not being a distant one, and that the emperor hath a palace near the very sources.

If it be doubted whether Mr Bruce hath visited every source of the Nile, it may be answered, that perhaps no Englishman hath taken this trouble with regard to the sources of the Thames, which, like most other great rivers, is probably derived from many springs and rills in different directions.

The other objection which we have often heard, is, "That Mr Bruce hath mentioned in conversation, that the Abyssinians cut a slice from the living ox, esteeming it one of their greatest delicacies."

This sort of dainty, indeed, is not so considered in other parts of the globe; but every nation almost hath its peculiarities in the choice of their food. Do not we eat raw oysters within a second of their being separated from the shell? And do not we roast both them and lobsters whilst alive; the barbarity of which practice seems to equal that of the Abyssinians? Do not cooks skin eels whilst alive? And do not epicures crimp fish for the gratification of their appetites?

That the Abyssinians eat beef in a raw state, is agreed both by Lobo and Poncet; and the former says, *reeking* from the beast. Mr Antes, moreover, was told by a Franciscan monk, who went with the caravan from Abyssinia to Cairo (*d*), that he was witness to an ox being killed, and immediately devoured by the band of travellers.

One reason, perhaps, for this usage may be, the great heat of the climate, which will not permit meat to be kept a sufficient time to make it tender (as with us); and it is generally allowed, that a fowl, dressed immediately after it is killed, is in better order for eating than if it is kept four and twenty hours.

Is it therefore extraordinary, that an Abyssinian epicure may really find (or perhaps fancy) that a piece cut from the beast whilst alive, may be more tender, or have a better relish, than if it is previously killed by the butcher? To this may be added, that according to the information which has been received on this head, Mr Bruce's account of this practice is much misrepresented by the objectors, who suppose that the ox lives a considerable time after these pieces are cut from it. When these dainty bits, however, have been sent to the great man's table (and which are probably taken from the fleshy parts), the beast soon afterwards expires, when the first artery is cut in providing slices for the numerous attendants.

Upon the whole, the not giving credit to a traveller, because he mentions an usage which is very different from ours (and is undoubtedly very barbarous), seems rather to argue ignorance than acuteness.

This brings to recollection the incredulity which

was shown to another distinguished traveller, Dr Shaw; who having mentioned, in an Oxford common room, that some of the Algerines were fond of lion's flesh, never could obtain any credit afterwards from his brother-fellows of the same college, though many of them were learned men. It is well known, however, though Dr Shaw states this same circumstance in the publication of his travels, that he is cited with the greatest approbation in almost every part of Europe. Sir William Temple somewhere mentions, that a Dutch governor of Batavia, who lived much with one of the most considerable inhabitants of Java, could never obtain any credit from him after having mentioned that in Holland water became a solid body. The traveller who first saw a flying fish probably told every one of this extraordinary circumstance as soon as he set his foot on shore, and was probably discredited with regard to the other particulars of his voyage.

The natural cause and progress of the incredulity which a traveller generally experiences, seems to be the following: When he returns from a distant and little frequented country, every one is impatient to hear his narrative; from which, of course, he selects the more striking parts, and particularly the usages which differ most from our own. Some of the audience disbelieving what the traveller hath mentioned, put questions to him which show their distrust. The traveller by this treatment becomes irritated, and answers some of them peevishly, others ironically, of which the interrogators afterwards take advantage to his prejudice. Nothing is more irritating to an ingenuous person than to find his assertions are disbelieved. This is commonly experienced in the cross examinations of almost every witness. To the distresses of the traveller on his return, we may add, the being often teased by very ignorant questions.

ABYSSINIAN, in ecclesiastical history, is used as the name of a sect, or heresy, in the Christian church, established in the empire of Abyssinia. The Abyssinians are a branch of the Copts or Jacobites; with whom they agree in admitting but one nature in Jesus Christ, and rejecting the council of Chalcedon: whence they are also called Eutychians, and stand opposed to the Melchites. They are only distinguished from the Copts, and other sects of Jacobites, by some peculiar national usages.—The Abyssinian sect or church is governed by a bishop or metropolitan styled *Abuna*, sent them by the Coptic patriarch of Alexandria residing at Cairo, who is the only person that ordains priests. The next dignity is that of *Komos*, or *Hegumenas*, who is a kind of arch-prefbyter. They have canons also, and monks: the former of whom marry; the latter, at their admission, vow celibacy, but with a reservation: these, it is said, make a promise aloud, before their superior, to keep chastity; but add, in a low voice, *as you keep it*. The emperor has a kind of supremacy in ecclesiastical matters. He alone takes cognisance of all ecclesiastical causes, except some

in the archives of the College *de propaganda fide* at Rome. It is believed that there are many other curious particulars for the illustration of geography to be found in the same depository. Dr Shaw mentions, moreover, some papers of Lippi (who accompanied the French embassy into Abyssinia, A. D. 1704), which are to be found in the botanical library at Oxford.

(*d*) This points out another channel by which a traveller of enterprise may visit Abyssinia.

Abyssinian some smaller ones reserved to the judges; and confers all benefices, except that of Abuna.—The Abyssinians have at different times expressed an inclination to be reconciled to the see of Rome; but rather out of interest of state than any other motive. The emperor David, or the queen regent on his behalf, wrote a letter on this head to pope Clement VII. full of submission, and demanding a patriarch from Rome to be instructed by: which being complied with, he publicly abjured the doctrine of Eutychius and Dioscorus in 1626, and allowed the supremacy of the pope. Under the emperor Seltan Seghed all was undone again; the Romish missionaries settled there had their churches taken from them, and their new converts banished or put to death. The congregation *de propaganda* have made several attempts to revive the mission, but to little purpose.—The doctrines and ritual of this sectary form a strange compound of Judaism, Christianity, and superstition. They practise circumcision; and are said to extend the practice to the females as well as males: They observe both Saturday and Sunday sabbaths: they eat no meats prohibited by the law of Moses: women are obliged to the legal purifications: and brothers marry their brothers wives, &c. On the other hand, they celebrate the epiphany with peculiar festivity, in memory of Christ's baptism; when they plunge and sport in ponds and rivers; which has occasioned some to affirm that they were baptized anew every year. Among the saints-days is one consecrated to Pilate and his wife; by reason Pilate washed his hands before he pronounced sentence on Christ, and his wife desired him to have nothing to do with the blood of that just person. They have four lents: the great one commences ten days earlier than ours, and is observed with much severity, many abstaining therein even from fish, because St Paul says there is one kind of flesh of men, and another of fishes. They allow of divorce, which is easily granted among them, and by the civil judge; nor do their civil laws prohibit polygamy itself. They have at least as many miracles and legends of saints as the Romish church; which proved no small embarrassment to the Jesuit missionaries, to whom they produced so many miracles, wrought by their saints, in proof of their religion, and those so well circumstantiated and attested, that the Jesuits were obliged to deny miracles to be any proof of a true religion; and in proof hereof, to allege the same arguments against the Abyssinians which Protestants in Europe allege against Papists. They pray for the dead, and invoke saints and angels; have so great a veneration for the virgin, that they charged the Jesuits with not rendering her honour enough. Images in painting they venerate; but abhor all those in relievo, except the cross. They hold that the soul of man is not created; because, say they, God finished all his work on the sixth day. They admit the apocryphal books, and the canons of the apostles, as well as the apostolical constitutions, for genuine. Their liturgy is given by Alvarez, and in English by Pagit.

ACA, ACE, or ACON, a town of Phœnicia, on the Mediterranean; afterwards called *Ptolemais*; now *Acre*. See **ACRE**.

ACACALOTL, the Brazilian name of a bird called by some *corvus aquaticus*, or the water raven: properly, the pelicanus carbo, or corvorant. See **PELICANUS**.

ACACIA, EGYPTIAN THORN, or BINDING BEAN-TREE, in botany, a species of *Mimosa*, according to Linnæus; though other botanists make it a distinct genus. See **MIMOSA**.

The flowers of a species of the acacia are used by the Chinese in making that yellow which we see bears washing in their silks and stuffs, and appears with so much elegance in their painting on paper. The method is this:

They gather the flowers before they are fully open; these they put into a clean earthen vessel over a gentle heat, and stir them continually about, as they do the tea leaves, till they become dryish and of a yellow colour; then to half a pound of the flowers they add three spoonfuls of fair water, and after that a little more, till there is just enough to hold the flowers incorporated together: they boil this for some time, and the juice of the flowers mixing with the water, it becomes thick and yellow; they then take it from the fire, and strain it through a piece of coarse silk. To the liquor they add half an ounce of common alum, and an ounce of calcined oyster-shells reduced to a fine powder. All is then well mixed together; and this is the fine lasting yellow they have so long used.

The dyers of large pieces use the flowers and seeds of the acacia for dyeing three different sorts of yellow. They roast the flowers, as before observed; and then mix the seeds with them, which must be gathered for this purpose when full ripe: by different admixture of these, they give the different shades of colour, only for the deepest of all they give a small mixture of Brazil wood.

Mr Geoffroy attributes the origin of bezoar to the seeds of this plant; which being broused by certain animals, and vellicating the stomach by their great sourness and astringency, cause a condensation of the juices till at length they become coated over with a stony matter, which we call **BEZOAR**.

False ACACIA. See **ROBINIA**.

Three-thorned ACACIA, or Honey-locust. See **GLEDISTIA**.

ACACIA, in the materia medica, the inspissated juice of the unripe fruit of the *Mimosa Nilotica*.

This juice is brought to us from Egypt, in roundish masses, wrapt up in thin bladders. It is outwardly of a deep brown colour, inclining to black; inwardly of a reddish or yellowish brown; of a firm consistence, but not very dry. It soon softens in the mouth, and discovers a rough, not disagreeable, taste, which is followed by a sweetish relish. This inspissated juice entirely dissolves in watery liquors; but is scarce sensibly acted on by rectified spirit.

Acacia is a mild astringent medicine. The Egyptians give it in spitting of blood, in the quantity of a dram, dissolved in any convenient liquor; and repeat this dose occasionally: they likewise employ it in collyria for strengthening the eyes, and in gargarisms for quinsys. Among us, it is little otherwise used than as an ingredient in mithridate and theriaca, and is rarely met with in the shops. What is usually sold for the Egyptian acacia, is the inspissated juice of unripe sloes: this is harder, heavier, of a darker colour, and somewhat sharper taste, than the true sort. See the next article.

German ACACIA, the juice of unripe sloes inspissated nearly

Acacia
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Academics.

nearly to driness over a gentle fire, care being taken to prevent its burning. It is moderately astringent, similar to the Egyptian acacia, for which it has been commonly substituted in the shops. It is given in fluxes, and other disorders where styptic medicines are indicated, from a scruple to a dram.

ACACIA, among antiquaries, something resembling a roll or bag, seen on medals, as in the hands of several consuls and emperors. Some take it to represent a handkerchief rolled up, wherewith they made signals at the games; others, a roll of petitions or memorials; and some, a purple bag full of earth, to remind them of their mortality.

ACACIANS, in ecclesiastical history, the name of several sects of heretics; some of which maintained, that the Son was only a similar, not the same, substance with the Father; and others, that he was not only a distinct, but a dissimilar, substance. Two of these sects had their denomination from Acacius bishop of Cæsarea, who lived in the fourth century, and changed his opinions, so as, at different times, to be head of both. Another was named from Acacius patriarch of Constantinople, who lived in the close of the fifth century.

ACACIUS, surnamed Luscus, because he was blind of one eye, was bishop of Cæsarea in Palestine, and succeeded the famous Eusebius; he had a great share in the banishment of Pope Liberius, and bringing Felix to the see of Rome. He gave name to a sect, and died about the year 365. He wrote the life of Eusebius, and several other works.

ACACIUS (St), bishop of Amida, in Mesopotamia, in 420, was distinguished by his piety and charity. He sold the plate belonging to his church, to redeem seven thousand Persian slaves who were ready to die with want and misery; and giving each of them some money, sent them home. Veranius their king was so affected with this noble instance of benevolence, that he desired to see the bishop; and this interview procured a peace between that prince and Theodosius I.

There have been several other eminent persons of the same name; particularly, A martyr under the emperor Decius: A patriarch of Antioch, who succeeded Basil in 458, and died in 459: A bishop of Miletum in the fifth century: A famous rhetorician in the reign of the emperor Julian: and, A patriarch of Constantinople in the fifth century; who was ambitious to draw the whole power and authority of Rome by degrees to Constantinople, for which he was delivered over irretrievably to the devil by Pope Felix III.

ACAD, or ACHAD (anc. geog.), the town in which Nimrod reigned, called *Archad* by the Seventy; situated in Babylonia, to the eastward of the Tigris.

ACADEMICIAN, or ACADEMIST, a member of an academy. See ACADEMY in the modern sense.

ACADEMICS, or ACADEMISTS, a denomination given to the cultivators of a species of philosophy originally derived from Socrates, and afterwards illustrated and enforced by Plato, who taught in a grove near Athens, consecrated to the memory of *Academos*, an Athenian hero; from which circumstance this philosophy received the name of *academical*. Before the days of Plato, philosophy had in a great measure fallen into contempt. The contradictory systems and hypotheses which had successfully been urged upon the

world were become so numerous, that, from a view of this inconstancy and uncertainty of human opinions, many were led to conclude, that truth lay beyond the reach of our comprehension. Absolute and universal scepticism was the natural consequence of this conclusion. In order to remedy this abuse of philosophy and of the human faculties, Plato laid hold of the principles of the academical philosophy; and, in his *Phædo*, reasons in the following manner. "If we are unable to discover truth (says he), it must be owing to two circumstances: either there is no truth in the nature of things; or the mind, from a defect in its powers, is not able to apprehend it. Upon the latter supposition, all the uncertainty and fluctuation in the opinions and judgments of mankind admit of an easy solution: Let us therefore be modest, and ascribe our errors to the real weakness of our own minds, and not to the nature of things themselves. Truth is often difficult of access: in order to come at it, we must proceed with caution and diffidence, carefully examining every step; and, after all our labour, we will frequently find our greatest efforts disappointed, and be obliged to confess our ignorance and weakness."

Labour and caution in their researches, in opposition to rash and hasty decisions, were the distinguishing characteristics of the disciples of the ancient academy. A philosopher, possessed of these principles, will be slow in his progress; but will seldom fall into errors, or have occasion to alter his opinion after it is once formed. Vanity and precipitance are the great sources of scepticism: hurried on by these, instead of attending to the cool and deliberate principles recommended by the academy, several of our modern philosophers have plunged themselves into an absurd and ridiculous kind of scepticism. They pretend to discredit subjects that are plain, simple, and easily comprehended; but give peremptory and decisive judgments upon things that evidently exceed the limits of our capacity. Of these, Berkeley and Hume are the most considerable. Berkeley denied the existence of every thing, excepting his own ideas. Mr Hume has gone a step further, and questioned even the existence of ideas; but at the same time has not hesitated to give determined opinions with regard to eternity, providence, and a future state, miraculous interpositions of the Deity, &c. subjects far above the reach of our faculties. In his essay on the academical or sceptical philosophy, he has confounded two very opposite species of philosophy. After the days of Plato, indeed, the principles of the first academy were grossly corrupted by Arcefilas, Carneades, &c. This might lead Mr Hume into the notion that the *academical* and *sceptical* philosophy were synonymous terms. But no principles can be of a more opposite nature than these which were inculcated by the old academy of Socrates and Plato, and the sceptical notions which were propagated by Arcefilas, Carneades, and the other disciples of the succeeding academies.

ACADEMY, in antiquity, a garden, villa, or grove, situated within a mile of Athens, where Plato and his followers held their philosophical conferences. It took its name from one *Academos*, or *Ecademos*, who was the original owner of it, and made it a kind of gymnasium. He lived in the time of Theseus; and, after his death, it retained his name, and was consecrated to his

Academies
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Academy.

Academies. his memory. Cimon embellished it with fountains, trees, and walks; but Sylla, during the siege of Athens, employed these very trees in making battering engines against the city. Cicero too had his villa, or place of retirement, near Puzzuoli, which he also named an *academy*, where he composed his *Academical Questions*, and his book *De natura deorum*.

ACADEMY, among the moderns, is most commonly used to signify a SOCIETY of learned men, established for the improvement of any art or science, and generally under the protection of a prince.

The first Academy we read of was established by Charlemagne, at the instigation of ALCUIN. It was composed of the chief wits of the court, the emperor himself being a member. In their academical conferences, every person was to give an account of what ancient authors he had read; and each even assumed the name of some ancient author who pleased him most, or some celebrated person of antiquity. Alcuin, from whose letters we learn these particulars, took that of Flaccus, the surname of Horace: a young lord, named Augilbert, took that of Homer: Adelard, bishop of Corbie, was called Augustin: Riculfe, bishop of Mentz, was Dametas; and the king himself, David. This shows the mistake of some modern writers, who relate, that it was in conformity with the genius of the learned men of those times, who were great admirers of Roman names, that Alcuin took the name of Flaccus Albinus.

Most nations have now their academies; but Italy has the greatest number.—The French have many flourishing academies, most of which were established by Louis XIV.—We have but few in Britain; and those of chiefest note go by a different name. See the article SOCIETY.

In giving an account of the principal Academies, it seems most proper to arrange them according to their subjects.

I. *MEDICAL Academies*, as that of the *Naturæ Curiosæ* in Germany; that founded at Palermo in 1645; another at Venice in 1701, which meets weekly in a hall near the grand hospital; another at Geneva in 1745, in the house of M. Le Clerc. The colleges of physicians at London and Edinburgh are also, by some, ranked in the number of *Academies*.

The Academy of *Naturæ Curiosæ*, called also the Leopoldine Academy, was founded in 1652 by Jo. Laur. Bauschius, a physician; who, in imitation of the English, published an invitation to all physicians to communicate their extraordinary cases; and, meeting with success, was elected president. Their works were at first published separately; but in 1670 a new scheme was laid for publishing a volume of observations every year. The first volume appeared in 1684, under the title of *Ephemerides*, and the work has been continued with some interruptions and variations of the title, &c. In 1687, the emperor Leopold took the society under his protection, granting the members several privileges, particularly that their presidents should be counts palatine of the holy Roman empire. This academy has no fixed residence, nor regular assemblies: instead of these, there is a kind of bureau, or office, first established at Breslau, and afterwards removed to Nuremberg, where letters, observations, &c. from correspondents or members are taken in. The academy consists of a

president, two adjuncts or secretaries, and colleagues or **Academies.** members without restriction. The colleagues, at their admission, oblige themselves to two things: first, to choose some subject out of the animal, vegetable, or mineral kingdom, to handle, provided it had not been treated of by any colleague before; the second, to apply themselves to furnish materials for the Annual *Ephemerides*. Each member to bear a symbol of the Academy; viz. a gold ring; whereon, instead of a stone, is a book open, and on the face thereof, an eye; on the other side the motto of the academy, *Nunquam otiosus*.

II. *CHIRURGICAL Academies*; as that instituted some years ago, by public authority, at Paris: the members of which were not only to publish their own and correspondents observations and improvements; but to give an account of all that is published on surgery, and to compose a complete history of the art, by their extracts from all the authors ancient and modern who have wrote on it. A question in surgery is annually proposed by the academy, and a gold medal of 200 livres value given to him who furnishes the most satisfactory answer.

Academy of Surgery at Vienna, was instituted some years ago by the present emperor, under the direction of the celebrated Brambilla. In this there were at first only two professors; and to their charge the instruction of 130 young men was committed, 30 of whom had formerly been surgeons in the army. But of late the number both of the teachers and pupils has been considerably increased. Gabrieli has been appointed to teach pathology and practice; Boecking, anatomy, physiology, and physics; Streit, medical and pharmaceutical surgery; Hunczowsky, surgical operations, midwifery, and the *chirurgia forensis*; and Plenck, chemistry and botany. To these also has been added, Beindl, as professor and extraordinary professor of surgery and anatomy. Besides this, the emperor, with his usual liberality, has provided a large and splendid edifice in Vienna, which affords habitation both for the teachers, the students, pregnant women, patients for clinical lectures, and servants. He has also purchased for the use of this academy a medical library, which is open every day; a complete set of surgical instruments; an apparatus for experiments in natural philosophy; a collection of natural history; a number of anatomical and pathological preparations; a collection of preparations in wax brought from Florence; and a variety of other useful articles. Adjoining to the building also there is a good botanical garden.

Among other parts of this institution, three prize-medals, each of the value of 40 florins, are to be annually bestowed on those students who return the best answer to questions proposed the year before. These prizes are not entirely founded by the emperor, but are in part owing to the liberality of Brendellus, the *protochirurgus* at Vienna.

III. *ECCLIASTICAL Academies*; as that at Bologna in Italy, instituted in 1687, employed in the examination of the doctrine, discipline, and history, of each age of the church.

IV. *COSMOGRAPHICAL Academies*; as that at Venice, called the *Argonauts*. This was instituted at the solicitation of F. Coronelli, for the improvement of geographical knowledge. Its design was to publish exact maps, both celestial and terrestrial, as well particular

Academy. ticular as general, together with geographical, historical, and astronomical descriptions. Each member, in order to defray the expence of such a publication, was to subscribe a proportional sum, for which they were to receive one or more copies of each piece published. For this end three societies are settled; one under F. Moro, provincial of the Minorities in Hungary; another under the Abbot Laurance au Ruy Payenne au Marais; the third under F. Baldigiani, Jesuit, professor of mathematics in the Roman college. The device of this academy is the terraqueous globe, with the motto *Plus ultra*; and at its expence all the globes, maps, and geographical writings, of F. Coronelli have been published.

V. *Academies of SCIENCES*.—These comprehend such as are erected for improving natural and mathematical knowledge. They are otherwise called *Philosophical* and *Physical* academies.

The first of these was instituted at Naples about the year 1560, in the house of Baptista Porta. It was called the *Academy Secretorum Naturæ*; and was succeeded by the *Academy of Lyncei*, founded at Rome by Prince Frederic Cesi, towards the end of that century. Several of the members of this academy rendered it famous by their discoveries; among these was the celebrated Galileo. Several other academies were instituted about that time, which contributed greatly to the advancement of the sciences; but none of them comparable to that of the *Lyncei*.

Some years after the death of Toricelli, the *Academy del Cimento* made its appearance, under the protection of Prince Leopold, afterwards Cardinal de Medicis. Redi was one of its chief members; and the studies pursued by the rest may be collected from those curious experiments published in 1667, by their secretary Count Laurence Magulotti, under the title of *Saggi di Naturali Esperienze*; a copy of which was presented to the Royal Society, translated into English by Mr Waller, and published at London in 4to.

The *Academy degl'Inquieti*, afterwards incorporated into that of Della Tracia in the same city, followed the example of that of Del Cimento. Some excellent discourses on physical and mathematical subjects, by Geminiano Montenari, one of the chief members, were published in 1667, under the title of *Persieri Fisico Matematici*.

The *Academy of Rossano*, in the kingdom of Naples, was originally an academy of Belles Lettres, founded in 1540, and transformed into an Academy of Sciences in 1695 at the solicitation of the learned abbot Don Giacinto Gimma; who being made president, under the title of Promoter General thereof, gave them a new set of regulations. He divided the academists into the following classes: Grammarians, Rhetoricians, Poets, Historians, Philosophers, Physicians, Mathematicians, Lawyers, and Divines, with a class apart for Cardinals, and persons of quality. To be admitted a member, a man must have some degrees in the faculty. The members are not allowed to take the title of *Academists* in the beginning of their books, without a written permission from their president, which is not granted till the work has been examined by the censors of the academy; and the permission is the greatest honour the academy can confer, as they thereby adopt the work, and are answerable for it against all criticism.

cisms that may be made upon it. To this law the president or promoter himself is subject; and no academist is allowed to publish any thing against the writings of another without leave from the society.

Several other Academies of *Sciences* have been founded in Italy; but, for want of being supported by princes, did not continue long. The loss of them, however, was abundantly repaired by the institution of others still subsisting; such as, the *Academy of Filarmonici* at Verona; of *Ricovatri* at Padua, where a learned discourse on the origin of springs was delivered by Sig. Vallisnieri, first professor of physic in the university of that city, and which was afterwards printed. To the Academy of the *Muti de Reggio*, at Modena, the same Sig. Vallisnieri presented an excellent discourse on the scale of created beings, since inserted in his history of the generation of man and animals printed at Venice in the year 1721.

F. Merfenne is said to have given the first idea of a philosophical academy in France, towards the beginning of the 17th century, by the conferences of naturalists and mathematicians occasionally held at his lodgings; at which Gassendi, Des Cartes, Hobbes, Roberval, Pascal, Blondel, and others assisted. F. Merfenne proposed to each certain problems to examine, or certain experiments to be made. These private assemblies were succeeded by more public ones, formed by Mr Montmort, and Mr Thevenot the celebrated traveller. The French example animated several Englishmen of distinction and learning to erect a kind of philosophical academy at Oxford, towards the close of Oliver Cromwell's administration; which, after the Restoration, was erected into a Royal Society. See SOCIETY. The English example, in its turn, animated the French. Louis XIV. in 1666, assisted by the counsels of Mr Colbert, founded an academy of sciences at Paris, with a sufficient revenue to defray the charge of experiments, and salaries to the members.

Royal Academy of Sciences. After the peace of the Pyrenees, Louis XIV. being desirous of establishing the arts, sciences, and literature, upon a solid foundation, directed M. Colbert to form a society of men of known abilities and experience in the different branches, who should meet together under the king's protection, and communicate their respective discoveries. Accordingly Mr Colbert, having conferred with those who were at that time most celebrated for their learning, resolved to form a society of such persons as were conversant in natural philosophy and mathematics, to join to them other persons skilled in history and other branches of erudition, along with those who were entirely engaged in what are called the *Belles Lettres*, grammar, eloquence, and poetry. The geometricians and natural philosophers were ordered to meet on Tuesdays and Saturdays, in a great hall of the king's library, where the books of mathematics and natural philosophy were contained; the learned in history to assemble on Mondays and Thursdays, in the hall where the books of history were contained; and the class of *Belles Lettres* to assemble on Wednesdays and Fridays. All the different classes were likewise ordered to meet together upon the first Thursday of every month; and, by their respective secretaries, make a report of the proceedings of the foregoing month.

In a short time, however, the classes of History, Belles

Academies. Belles Lettres, &c. were united to the *French Academy*, which was originally instituted for the improvement and refining the French language; so that the royal Academy contained only two classes, viz. that of natural philosophy and mathematics.

In the 1696, the king, by a proclamation dated the 26th of January, gave this Academy a new form, and put it upon a more respectable footing.—It was now to be composed of four kinds of members, viz. *honorary, pensionary associates*, and *eleves*. These last were a kind of pupils, or scholars, each of whom was attached to one of the pensionaries. The first class to contain ten persons, and each of the rest twenty. The honorary academists to be all inhabitants of France; the pensionaries all to reside at Paris; eight of the associates allowed to be foreigners; and the *eleves* all to live at Paris. The officers to be, a president named by the king, out of the class of honorary academists; and a secretary and treasurer to be perpetual. Of the pensionaries, three to be geometers, three astronomers, three mechanics, three anatomists, three chemists, three botanists, and the remaining two to be secretary and treasurer. Of the twelve associates, two to apply themselves to geometry, two to botany, and two to chemistry. The *eleves* to apply themselves to the same kind of science with the pensionaries they were attached to; and not to speak, except when called by the president. No regular or religious to be admitted, except into the class of honorary academists; nor any person to be admitted either for associate or pensionary, unless known by some considerable printed work, some machine, or other discovery. The assemblies were held on Wednesdays and Saturdays, unless either of them happened to be a holiday, and then the assembly was held on the preceding day.—To encourage the members to pursue their labours, the king engaged not only to pay the ordinary pensions, but even to give extraordinary gratifications, according to the merit of their respective performances; furnishing withal the expence of the experiments and other inquiries necessary to be made. If any member gave in a bill of charges of experiments he had made, or desired the printing of any book, and brought in the charges of graving, the money was immediately paid by the king, upon the president's allowing and signing the bill. So, if an anatomist required live tortoises, for instance, for making experiments about the heart, &c. as many as he pleased were brought him at the king's charge. Their motto was *Invenit et perfecit*.

In the year 1716, the duke of Orleans, then regent, made an alteration in their constitution; augmenting the number of honoraries, and of associates capable of being foreigners, to 12; admitting regulars among such associates; and suppressing the class of *eleves*, as it appeared to be attended with some inconveniences, particularly that of making too great an inequality among the academists, and being productive of some misunderstandings and animosities among the members. At the same time he created other two classes; one consisting of 12 adjuncts, who, as well as the associates, were allowed a deliberative voice in matters relative to science; and the other six free associates, who were not attached to any particular science, nor obliged to pursue any particular work.

Since its re-establishment in 1699, this academy has

VOL. I. Part I.

been very exact in publishing, every year, a volume containing either the works of its own members, or such memoirs as have been composed and read to the academy during the course of that year. To each volume is prefixed the history of the academy, or an extract of the memoirs, and, in general, of whatever has been read or said in the academy; at the end of the history, are the eulogiums on such academists as have died that year.—M. Rouille de Meslay, counsellor to the parliament of Paris, founded two prizes, one of 2500, and the other of 2000 livres, which are alternately distributed by the parliament every year: the subject for the first must relate to physical astronomy, and those for the latter to navigation and commerce.

Notwithstanding the advantages which the members of this academy enjoy over others, in having their expences defrayed, and even being paid for their time and attendance, they have fallen under some imputations, particularly that of plagiarism, or borrowing their neighbours inventions; but with what justice we do not say.

The French have also considerable academies in most of their great cities: as, at Montpellier, a royal academy of sciences on the like footing as that at Paris, being as it were a counter part thereof; at Thoulouse, an academy under the denomination of Lanternists; others at Nismes, Arles, Lyons, Dijon, Bourdeaux, &c.

The *Royal Academy of Sciences at Berlin* was founded in 1700, by Frederic II. king of Prussia, on the model of that of England; excepting that, besides natural knowledge, it likewise comprehends the Belles Lettres. In 1718, it was ordained that the president shall be one of the counsellors of state, and nominated by the king. The members were divided into four classes; the first for prosecuting physics, medicine, and chemistry; the second for mathematics, astronomy, and mechanics; the third for the German language and the history of the country; the fourth for oriental learning, particularly as it may concern the propagation of the gospel among infidels. Each class to elect a director for themselves, who shall hold his post for life. The members of any of the classes have free admission into the assemblies of any of the rest.

The great promoter of this institution was the celebrated Mr Leibnitz, who accordingly was made the first director. The first volume of their transactions was published in 1710, under the title of *Miscellanea Berolinensia*; and though they received but few marks of the royal favour for some time, they continued to publish new volumes in 1723, 1727, 1734, and 1740. At last, however, Frederic III. the late king of Prussia, gave new vigour to this academy, by inviting to Berlin such foreigners as were most distinguished for their merit in literature, and encouraged his subjects to prosecute the study and cultivation of the sciences by giving ample rewards; and thinking that the academy, which till that time had had some minister or opulent nobleman for its president, would find an advantage in having a man of letters at its head, he conferred that honour on M. Maupertuis. At the same time, he gave a new regulation to the academy, and took upon himself the title of its protector.

The academists hold two public assemblies annually; one in January, on the late king's birth-day; and the

F

other

Academies. other in May, on the day of his accession to the throne. At the latter of these is given, as a prize, a gold medal of 50 ducats value: the subject for this prize is successively, natural philosophy, mathematics, metaphysics, and erudition.

The Imperial Academy of Sciences at Petersburg was projected by Czar Peter the Great. That great monarch having, during his travels, observed the advantage of public societies for the encouragement and promotion of literature, formed the design of founding an academy of sciences at St Petersburg. By the advice of Wolf and Leibnitz, whom he consulted on this occasion, the society was regulated, and several learned foreigners were invited to become members. Peter himself drew the plan, and signed it on the 10th of February 1724; but was prevented, by the suddenness of his death, from carrying it into execution. His decease, however, did not prevent its completion: for on the 21st of December 1725, Catharine I. established it according to Peter's plan; and on the 27th of the same month the society was first assembled. On the 1st of August 1726, Catharine honoured the meeting with her presence, when professor Bulfinger, a German naturalist of great eminence, pronounced an oration upon the advances made by the loadstone and needle for the discovery of the longitude.

The empress settled a fund of 4982 l. *per annum* for the support of the academy; and fifteen members, all eminent for their learning and talents, were admitted and pensioned, under the title of Professors in the various branches of literature and science. The most distinguished of these professors were Nicholas and Daniel Bernoulli, the two De Lilles, Bulfinger, and Wolf.

During the short reign of Peter II. the salaries of the members were discontinued, and the academy was utterly neglected by the court; but it was again patronized by the empress Anne, who even added a seminary for the education of youth, under the superintendence of the professors. Both institutions flourished for some time under the direction of Baron Korf; but upon his death, towards the latter end of Anne's reign, an ignorant person being appointed president, many of the most able members quitted Russia. At the accession of Elizabeth, new life and vigour were again restored to the academy: the original plan was enlarged and improved; some of the most learned foreigners were again drawn to Petersburg; and, what was considered as a good omen for the literature of Russia, two natives, Lomonosof and Rumovsky, men of genius and abilities, who had prosecuted their studies in foreign universities, were enrolled among its members. The annual income was increased to 10,659 l. and soon afterwards the new institution took place.

The present empress Catharine II. with her usual zeal for promoting the diffusion of knowledge, has taken this useful society under her more immediate protection. She has altered the court of directors greatly to the advantage of the whole body; she has corrected many abuses, and has infused a new spirit into their researches. By her Majesty's particular recommendation, the most ingenious professors have visited the various provinces of her vast dominions; and as the fund of the academy was not sufficient to supply the whole expence of these several expeditions, the empress be-

flowed a largess of 2000 l. which she has renewed as Academies. occasion has required.

The purpose and intent of these travels will appear from the instructions given by the academy to the several persons who were engaged in them. They were ordered to pursue their inquiries upon the different sorts of earths and waters; upon the best methods of cultivating the barren and desert spots; upon the local disorders incident to men and animals, and the most efficacious means of relieving them; upon the breeding of cattle, and particularly of sheep; on the rearing of bees and silk-worms; on the different places and objects for fishing and hunting; on minerals; on the arts and trades; and on forming a Flora Russica, or collection of indigenous plants: they were particularly instructed to rectify the longitude and latitude of the principal towns; to make astronomical, geographical, and meteorological observations; to trace the course of the rivers; to take the most exact charts; and to be very distinct and accurate in remarking and describing the manners and customs of the different people, their dresses, languages, antiquities, traditions, history, religion; and, in a word, to gain every information which might tend to illustrate the real state of the whole Russian empire.

In consequence of these expeditions, perhaps no country can boast, within the space of so few years, such a number of excellent publications on its internal state, on its natural productions, on its topography, geography, and history; on the manners, customs, and languages of the different people, as have issued from the press of this academy.

The first transactions of this society were published in 1728, and intitled, *Commentarii Academiae Scientiarum Imperialis Petropolitanae ad an. 1726*, with a dedication to Peter II. The publication was continued under this form until the year 1747, when its transactions were called *Novi Commentarii Academiae*, &c. In 1777 the academy again changed the title into *Acta Academiae Scientiarum Imperialis Petropolitanae*, and likewise made some alteration in the arrangement and plan of the work. The papers, which had been hitherto published in the Latin tongue, are now written either in that language or French; and a preface is added, styled *Partie Historique*, which contains an account of its proceedings, meetings, admission of new members, and other remarkable occurrences. Of the Commentaries, 14 volumes were published: the first of the New Commentaries made its appearance in 1750, and the twentieth in 1776. Under the new title of *Acta Academica*, several volumes have been given to the public, and two are printed every year. These transactions abound with ingenious and elaborate disquisitions upon various parts of science and natural history, and which reflect the greatest honour upon their authors; and it may not be an exaggeration to assert, that no society in Europe has more distinguished itself for the excellence of its publications, and particularly in the more abstruse parts of the pure and mixed mathematics.

The academy is still composed, as at first, of fifteen professors, beside the president and director. Each of these professors has a house and an annual stipend from 200 l. to 600 l. Beside the professors, there are four adjuncts, who are pensioned, and who are present at the

Academies the sittings of the society, and succeed to the first vacancies.—The direction of the academy is at present consigned to the Princess Dashkof.

The building and apparatus of this academy are extraordinary. There is a fine library, consisting of 36000 curious books and manuscripts.—There is an extensive museum, in which the various branches of natural history, &c. are distributed in different apartments: it is extremely rich in native productions, having been considerably augmented with a variety of specimens collected by Pallas, Gmelin, Guldenstaedt, and other learned professors, during their late expeditions through the Russian empire. The stuffed animals and birds occupy one apartment. The chamber of rarities, the cabinet of coins, &c. contain innumerable articles of the highest curiosity and value. The society has this modest motto, *Paulatim*.

The Academy of Sciences at Bologna, called the *Institute of Bologna*, was founded by Count Marigli in 1712, for the cultivating of physics, mathematics, medicine, chemistry, and natural history. Its history is written by M. de Limiers, from memoirs furnished by the founder himself.

The Academy of Sciences at Stockholm, or *Royal Swedish Academy*, owes its institution to six persons of distinguished learning, amongst whom was the celebrated Linnaeus: they originally met on the 2d of June 1739, formed a private society, in which some dissertations were read; and in the latter end of the same year their first publication made its appearance. As the meetings continued and the members increased, the society attracted the notice of the king, and was, on the 31st of March 1741, incorporated under the name of the Royal Swedish Academy. Not receiving any pension from the crown, it is only under the protection of the king, being directed, like our Royal Society, by its own members. It has now a large fund, which has chiefly arisen from legacies and other donations; but a professor of experimental philosophy, and two secretaries, are still the only persons who receive any salaries. Each of the members resident at Stockholm becomes president by rotation, and continues in office during three months. There are two species of members, native and foreign: the election of the former is held in April, and of the latter in July: no money is paid at the time of admission. The dissertations read at each meeting are collected and published four times in the year; they are written in the Swedish language, and printed in octavo, and the annual publications make a volume. The first 40 volumes, which were finished in 1779, are called the *Old Transactions*; for in the following year the title was changed into that of *New Transactions*. The king is sometimes present at the ordinary meetings, and particularly at the annual assembly in April for the election of members. Any person who sends a treatise which is thought worthy of being printed, receives the transactions for that quarter *gratis*, and a silver medal, which is not esteemed for its value, being worth only three shillings, but for its rarity and the honour conveyed by it. All the papers relating to agriculture are put forth separately under the title of *Oeconomica acta*. Annual premiums, in money and gold medals, principally for the encouragement of agriculture and inland trade, are also distributed by the academy. The

fund for these prizes is supplied from private donations. Academies.

The Royal Academy of Sciences at Copenhagen, owes its institution to the zeal of six literati, whom Christian VI. in 1742, ordered to arrange his cabinet of medals. The count of Holstein was the first president; and the six persons who first formed the design, were John Gram, Joachim Frederic Ramus, Christian Louis Scheid, Mark Woldickey, Eric Pontopidan, and Bernard Moelman. These persons occasionally meeting for that purpose, extended their designs; associated with them others who were eminent in several branches of science; and forming a kind of literary society, employed themselves in searching into, and explaining the history and antiquities of their country. The count of Holstein warmly patronized this society, and recommended it so strongly to Christian VI. that, in 1743, his Danish Majesty took it under his protection, called it the Royal Academy of Sciences, endowed it with a fund, and ordered the members to join to their former pursuits, natural history, physics, and mathematics. In consequence of the royal favour, the members engaged with fresh zeal in their pursuits; and the academy has published 15 volumes in the Danish language, some whereof have been translated into Latin.

The American Academy of Sciences, was established in 1780 by the council and house of representatives in the province of Massachusetts Bay, for promoting the knowledge of the antiquities of America, and of the natural history of the country; for determining the uses to which its various natural productions might be applied; for encouraging medicinal discoveries, mathematical disquisitions, philosophical inquiries and experiments, astronomical, meteorological, and geographical observations, and improvements in agriculture, manufactures, and commerce; and, in short, for cultivating every art and science which may tend to advance the interest, honour, dignity, and happiness, of a free, independent, and virtuous people. The members of this academy are never to be more than 200, nor less than 40.

VI. *Academies or Schools of Arts*; as that at Peterburgh, which was established by the empress Elizabeth, at the suggestion of count Shuvalof, and annexed to the academy of sciences: the fund was L. 4000 per annum, and the foundation for 40 scholars. The present empress has formed it into a separate institution, enlarged the annual revenue to L. 12,000, and augmented the number of scholars to 300; she has also constructed, for the use and accommodation of the members, a large circular building, which fronts the Neva. The scholars are admitted at the age of six, and continue until they have attained that of 18: they are clothed, fed, and lodged, at the expence of the crown. They are all instructed in reading and writing, arithmetic, the French and German languages, and drawing. At the age of 14 they are at liberty to choose any of the following arts, divided into four classes. 1. Painting in all its branches of history, portraits, battles, and landscapes; architecture; Mosaic; enamelling, &c. 2. Engraving on copperplates, seal-cutting, &c. 3. Carving in wood, ivory, and amber. 4. Watch-making, turning, instrument-making, casting statues in bronze and other metals, imitating gems and medals in paste and

Academies. other compositions, gilding, and varnishing. Prizes are annually distributed to those who excel in any particular art; and from those who have obtained four prizes, twelve are selected, who are sent abroad at the charge of the empress. A certain sum is paid to defray their travelling expences; and when they are settled in any town, they receive an annual salary of L. 60, which is continued during four years. There is a small assortment of paintings for the use of the scholars; and those who have made great progress are permitted to copy the pictures in the empress's collection. For the purpose of design, there are models in plaster of the best antique statues in Italy, all done at Rome, of the same size with the originals, which the artists of the academy were employed to cast in bronze.

The Royal Academy of Arts in London, was instituted for the encouragement of *Designing, Painting, Sculpture, &c. &c.* in the year 1768. This academy is under the immediate patronage of the king, and under the direction of 40 artists of the first rank in their several professions. It furnishes, in winter, living models of different characters to draw after; and in summer, models of the same kind to paint after. Nine of the ablest academicians are annually elected out of the 40, whose business is to attend by rotation, to set the figures, to examine the performance of the students, and to give them necessary instructions. There are likewise four professors, of *Painting, of Architecture, of Anatomy, and of Perspective*, who annually read public lectures on the subjects of their several departments; beside a president, a council, and other officers. The admission to this academy is free to all students properly qualified to reap advantage from the studies cultivated in it; and there is an annual exhibition of paintings, sculptures, and designs, open to all artists of distinguished merit.

The Academy of Painting and Sculpture at Paris. This took its rise from the disputes that happened between the master painters and sculptors in that capital; in consequence of which, M. Le Brun, Sarazin, Corneille, and others of the king's painters, formed a design of instituting a particular academy; and, having presented a petition to the king, obtained an *arret* dated Jan. 20. 1648. In the beginning of 1655, they obtained from cardinal Mazarin a brevet, and letters patent, which were registered in parliament; in gratitude for which favour, they chose the cardinal for their protector, and the chancellor for their vice-protector. In 1663, by means of M. Colbert, they obtained a pension of 4000 livres. The academy consists of a protector; a vice protector; a director; a chancellor; four rectors; adjuncts to the rectors; a treasurer; four professors, one of which is professor of anatomy, and another of geometry; several adjuncts and counsellors, an historiographer, a secretary, and two ushers.

The Academy of Painting holds a public assembly every day for two hours in the afternoon, to which the painters resort either to design or to paint, and where the sculptors model after a naked person. There are 12 professors, each of whom keeps the school for a month; and there are 12 adjuncts to supply them in case of need. The professor upon duty places the naked man as he thinks proper, and sets him in two different attitudes every week. This is what they call *setting the model*. In one week of the month he sets two models

together, which is called *setting the group*. The paintings and models made after this model, are called *academics*, or *academy-figures*. They have likewise a woman who stands for a model in the public school. Every three months, three prizes for design are distributed among the *eleves* or disciples; two others for painting, and two for sculpture, every year.

There is also an Academy of Painting, Sculpture, &c. at Rome, established by Lewis XIV. wherein those who have gained the annual prize at Paris are intitled to be three years entertained at the king's expence, for their further improvement.

The Academy of Architecture, established by M. Colbert in 1671, consisting of a company of skilful architects, under the direction of the superintendant of the buildings.

The Academy of Dancing, erected by Lewis XIV. with privileges above all the rest.

VII. *Academies of Law*; as that famous one at Beryta, and that of the *Sitientes* at Bologna.

VIII. *Academies of History*; as the *Royal Academy of Portuguese History at Lisbon*. This academy was instituted by king John V. in 1720. It consists of a director, four censors, a secretary, and 50 members; to each of whom is assigned some part of the ecclesiastical or civil history of the nation, which he is to treat either in Latin or Portuguese. In the church-history of each diocese, the prelates, synods, councils, churches, monasteries, academies, persons illustrious for sanctity or learning, places famous for miracles or relics, must be distinctly related in twelve chapters. The civil history comprises the transactions of the kingdom from the government of the Romans down to the present time. The members who reside in the country are obliged to make collections and extracts out of all the registers, &c. where they live. Their meetings to be once in 15 days.

A medal was struck by this academy in honour of their prince: the front of which was his effigy, with the inscription *Johannes V. Lusitanorum Rex*; and, on the reverse, the same prince is represented standing, and raising History almost prostrate before him, with the legend *Historia Resurges*. Underneath are the following words in abbreviature: REGIA ACADEMIA HISTORIAE LUSITANÆ, INSTITUTA VI. Idus Decembris. MDCCXX.

Academy of Suabian History at Tubingen, was lately established by some learned men, for publishing the best historical writings, the lives of the chief historians, and compiling new memoirs, on the several points and periods thereof.

IX. *Academies of Antiquities*; as that at Cortona in Italy, and at Upsal in Sweden. The first is designed for the study of *Hetrurian antiquities*; the other for illustrating the northern languages, and the antiquities of Sweden, in which notable discoveries have been made by it. The head of the *Hetrurian academy* is called *Lucomon*, by which the ancient governors of the country were distinguished. One of their laws is to give audience to poets only one day in the year; another is to fix their sessions, and impose a tax of a dissertation on each member in his turn.

The Academy of Medals and Inscriptions at Paris was set on foot by M. Colbert, under the patronage of Lewis XIV. in 1663, for the study and explanation of

Academies of ancient monuments, and perpetuating great and memorable events, especially those of the French monarchy, by coins, relieves, inscriptions, &c. The number of members at first was confined to four or five, chosen out of those of the French academy; who met in the library of Mr Colbert, from whom they received his majesty's orders. The days of their meetings were not determined; but generally they met on Wednesdays, especially in the winter season: but, in 1691, the king having given the inspection of this academy to M. de Pontchartrain comptroller general, &c. he fixed their meetings on Tuesdays and Saturdays.

By a new regulation, dated the 16th of July 1701, the academy was composed of ten *honorary* members; ten *associates*, each of whom had two declarative voices; ten *pensionaries*; and ten *elevés*, or pupils. They then met every Tuesday and Wednesday, in one of the halls of the Louvre; and had two public meetings yearly, one the day after Martinmas and the other the 16th after Easter. The class of *elevés* has been suppressed, and united to the associates. The king nominates their president and vice-president yearly; but their secretary and treasurer are perpetual. The rest are chosen by the members themselves, agreeably to the constitutions on that behalf given them.

One of the first undertakings of this academy, was to compose, by means of medals, a connected history of the principal events of Lewis XIV's reign: but in this design they met with great difficulties, and of consequence it was interrupted for many years; but at length it was completed down to the advancement of the duke of Anjou to the crown of Spain.

In this celebrated work, the establishment of the academy itself was not forgot. The medal on this subject represents Mercury sitting, and writing with an antique stylus on a table of brass; he leans with his left hand upon an urn full of medals, and at his feet are several others placed upon a card: the legend, *Rerum gestarum fides*; and on the exergue, *Academia regia inscriptionum et numismatum, instituta M.DC.LXII.* signifying that the Royal Academy of Medals and Inscriptions, founded in 1663, ought to give to future ages a faithful testimony of all great actions. Besides this work, we have several volumes of their memoirs; and their history, written and continued by their secretaries.

X. *Academies of BELLES LETTRES*, are those where in eloquence and poetry are chiefly cultivated. These are very numerous in Italy, and not uncommon in France.

The *Academy of Umidi at Florence* has contributed greatly to the progress of the sciences by the excellent Italian translations given, by some of its members, of the ancient Greek and Latin historians. Their chief attention is to the Italian poetry, at the same time that they have applied themselves to the polishing of their language, which produced the *Academy la Crusca*.

The *Academy of Humorists, Umoristi*, had its origin at Rome from the marriage of Lorenzo Marcini, a Roman gentleman; at which several persons of rank were guests; and, it being carnival time, to give the ladies some diversion, they took themselves to the reciting of verses, sonnets, speeches, first *extempore*, and

afterwards premeditatedly; which gave them the denomination of *Belli Humori*. After some experience, coming more and more into the taste of these exercises, they resolved to form an Academy of Belles Lettres; and changed the title of *Belli Humori* for that of *Humoristi*: choosing for their device a cloud, which, after being formed of exhalations from the salt waters of the ocean, returns in a gentle sweet shower; with this motto from Lucretius, *Redit agmine dulci*.

In 1690, the *Academy of Arcadi* was established at Rome, for reviving the study of Poetry and of the Belles Lettres. Besides most of the politer wits of both sexes in Italy, this academy comprehends many princes, cardinals, and other ecclesiastics; and, to avoid disputes about pre-eminence, all appear masked after the manner of Arcadian shepherds. Within ten years from its first establishment, the number of *Academists* amounted to six hundred. They hold assemblies seven times a year in a mead or grove, or in the gardens of some nobleman of distinction. Six of these meetings are employed in the recitation of poems and verses of the Arcadi residing at Rome; who read their own compositions; except ladies and cardinals, who are allowed to employ others. The seventh meeting is set apart for the compositions of foreign or absent members.

This academy is governed by a Custos, who represents the whole society, and is chosen every four years, with a power of electing 12 others yearly for his assistance. Under these are two sub-custodes, one vicar or pro-custos, and four deputies or superintendants, annually chosen. The laws of the society are immutable, and bear a near resemblance to the ancient model.

There are five manners of electing members. The first is by *acclamation*. This is used when sovereign princes, cardinals, and ambassadors of kings, desire to be admitted; and the votes are then given *viva voce*. The second is called *annumeration*. This was introduced in favour of ladies and academical colonies, where the votes are taken privately. The third, *representation*, was established in favour of colonies and universities, where the young gentry are bred; who have each a privilege of recommending one or two members privately to be balloted for. The fourth, *surrogation*; whereby new members are substituted in the room of those dead or expelled. The last, *destination*; whereby, when there is no vacancies of members, persons of poetical merit have the title of Arcadi conferred upon them till such time as a vacancy shall happen. All the members of this body, at their admission, assume new pastoral names, in imitation of the shepherds of Arcadia. The academy has several colonies of Arcadi in different cities of Italy, who are all regulated after the same manner.

XI. *Academies of LANGUAGES*; called, by some, *Grammatical Academies*: as,

The *Academy della Crusca at Florence*, famous for its vocabulary of the Italian tongue, was formed in 1582, but scarce heard of before the year 1584, when it became noted for a dispute between Tasso and several of its members. Many authors confound this with the Florentine academy. The discourses which Torricelli, the celebrated disciple of Galileo, delivered in the assemblies, concerning levity, the wind, the power of percussion, mathematics, and military architecture, are a

proof

Academies. proof that these academists applied themselves to things as well as words.

The *Academy of Fructiferi* had its rise in 1617, at an assembly of several princes and nobility of the country, who met with a design to refine and perfect the German tongue. It flourished long under the direction of princes of the empire, who were always chosen presidents. In 1668, the number of members arose to upwards of 900. It was prior in time to the French academy, which only appeared in 1629, and was not established into an academy before the year 1635. Its history is written in the German tongue by George Neumarck.

The *French Academy*, which had its rise from a meeting of men of letters in the house of M. Conrat, in 1629. In 1635, it was erected into an academy, by Cardinal Richlieu, for refining and ascertaining the French language and style.—The number of its members are limited to 40; out of whom a director, chancellor, and secretary, are to be chosen: the two former hold their posts for two months, the latter is perpetual. The members of this academy enjoy several privileges and immunities, among which is that of not being obliged to answer before any court but that of the king's household. They meet three times a-week in the Louvre; at breaking up, 40 silver medals are distributed among them, having on one side the king of France's head, and on the reverse, *Protecteur de l'Academie*, with laurel, and this motto, *A l'Immortalité*. By this distribution, the attendance of the *Academists* is secured, those who are present receiving the surplus otherwise intended for the absent. To elect or expel a member, at least 18 are required; nor can any be chosen unless he petition for it: by this expedient, the affront of refusals from persons elected is avoided. Religious are not admitted; nor can any nobleman, or person of distinction, be admitted on another footing than as a man of letters. None are to be expelled, except for base and dishonest practices; and there are but two instances of such expulsions, the first of M. Granier for refusing to return a deposit, the other of the Abbé Furetiere for plagiarism.—The design of this academy was to give not only rules, but examples, of good writing. They began with making speeches on subjects taken at pleasure, about 20 of which were printed. They met with great opposition from the parliament at their first institution; it being two years before the patents granted by the king would be registered. They have been severely satirized, and their style has been ridiculed as enervating instead of refining the French language. They are also charged with having surfeited the world by flattery, and having exhausted all the topics of panegyric in praise of their founder; it being a duty incumbent on every member, at his admission, to make a speech in praise of the king, the cardinal, the chancellor Seguier, and the person in whose place he is elected. The most remarkable work of this academy is a dictionary of the French tongue; which, after 50 years spent in settling the words and phrases to be used in writing, was at last published in 1694.

The foundation of an *Academy* similar to the above has been proposed at Petersburg by the learned prince Dashkof: it is to consist of 60 members. The plan has been approved by the empress, who has already given a fund for its support and establishment.

The *Royal Spanish Academy at Madrid* held its first *Academies* meeting in July 1713, in the palace of its founder, the Duke d'Escalona. It consisted at first of eight academists, including the Duke; to which number 14 others were afterwards added, the founder being chosen president or director. In 1714, the king granted them his confirmation and protection. Their device is a crucible in the middle of the fire, with this motto, *Limpia, Fija, y da Esplendor*; "it purifies, fixes, and gives brightness." The number of members is limited to 24; the Duke d'Escalona to be director for life, but his successors chosen yearly, and the secretary to be perpetual. Their object, as marked out by the royal declaration, was to cultivate and improve the national language: they were to begin with choosing carefully such words and phrases as have been used by the best Spanish writers; noting the low, barbarous, or obsolete ones; and composing a dictionary wherein these may be distinguished from the former.

XII. *Academies of POLITICS*; as that at Paris, consisting of six persons, who met at the Louvre, in the chamber where the papers relating to foreign affairs were lodged. But this academy proved of little service, as the kings of France were unwilling to trust any but their ministers with the inspection of foreign affairs.

For a further account of similar establishments, see the article SOCIETY.

ACADEMY is also a term for schools and other seminaries of learning among the Jews, where their rabbins and doctors instructed their youth in the Hebrew language, and explained to them the Talmud and the secrets of the Cabbala: Those of Tiberias and Babylon have been the most noted.

The Romans had a kind of military academies, established in all the cities of Italy, under the name of *Campi Martis*. Here the youth were admitted to be trained for war at the public expence. The Greeks, beside academies of this kind, had military professors called *Tactici*, who taught all the higher offices of war, &c. &c.

ACADEMY is often used with us to denote a kind of collegiate seminary, where youth are instructed in arts and sciences. There is one at Portsmouth for teaching navigation, drawing, &c.; another at Woolwich, for fortification, gunnery, &c.—Besides these, there are numerous academies, especially in London, for teaching mathematics, languages, writing, accounts, drawing, and other branches of learning.

The nonconformist ministers, &c. are bred up in private academies; as not approving the common university education. The principal of their academies are those in London, Daventry, and Warrington.

ACADEMY is likewise a name given to a riding-school, where young gentlemen are taught to ride the great horse, &c. and the ground allotted is usually called the *Manege*.

ACADEMY Figure, a drawing of a naked man or woman, taken from the life; which is usually done on paper with red or black chalk, and sometimes with pencils or CRAYONS. See ACADEMY, N^o VI. par. 4. *supra*.

ACADIE, or ACADY, in geography, a name formerly given to Nova Scotia, or New Scotland, in America. See *NOVA SCOTIA*.

ACÆNA, in antiquity, a Grecian measure of length, being a ten feet-rod, used in measuring their lands.

ACÆNA,

Acæna
||
Acangis.

ACÆNA, in botany, a genus of the monogynia order, belonging to the tetrandria class of plants; the characters of which are these: The *calyx* is a perianthium consisting of four leaves, which are ovate, concave, equal, and persistent; there is no *corolla*: The *stamina* consists of four equal middle-sized filaments opposite to the calyx; the antheræ are quadrangular, twin, erect: The *pistillum* has an inversely-ovate hispid germ; the stylus is small, and inflected on one side; and the stigma is a small thickish coloured membrane, divided into many segments: The *pericarpium* is an inversely-ovated dry one-celled berry covered with prickles bent backwards: The *seed* is single. There is only one species, a native of Mexico.

ACAJOU, or CASHEW-NUT-TREE. See ANACARDIUM.

ACALANDRUS, a river falling into the bay of Tarentum, not far from the Metapontum (Pliny, Strabo); now *Fiume de Roseto*.

ACALEPTIC, in ancient prosody, a complete verse.

ACALYPHA, the THREE-SEEDED MERCURY; a genus of plants belonging to the monœcia monadelphica class. The characters of this genus are the following.—*Male flowers* crowded above the female ones: The *calyx* is a three or four leaved perianthium, the leaflets roundish, concave, and equal: The *corolla* is wanting: The *stamina* have from 6 to 18 filaments, which are short, crowded, and connected at the base; the antheræ are roundish.—*Female flowers* fewer, placed beneath, and received into a large divided involucre: The *calyx* is a perianthium, consisting of three leaflets, which are concave, converging, small, and persistent: No *corolla*: The *pistillum* has a roundish germen; the styli are three, branchy, oftener tripartite, and long; the stigmata are simple: The *pericarpium* has a roundish trifurcated trilocular capsule, the valvules gaping two ways: The *seeds* are solitary, roundish, and large.—This genus ranks in the 38th natural order, *Tricocca*. There are five species, all natives of Virginia.

ACAMANTIS (the ancient name of the island of Cyprus), taken from one of its promontories situated to the west, and called *Acamas*. Teos in Ionia was also called thus from Acamus the founder.

ACAMAS, ACAMANTIS (anc. geog.), the west promontory of the island of Cyprus, from whence it took its ancient name; now Cape *Pisano*, or *Episano*, where formerly was a town of the same name, now a village called *Crusocco*.

ACAMAS, son of Theseus, followed the rest of the Grecian princes to the siege of Troy; and was deputed, with Diomedes, to the Trojans, in order to get Helen restored. Laodice, Priam's daughter, fell in love with him, stole a night with him, and had a son by him called *Munitus*. He was one of the heroes who concealed themselves in the wooden horse. One of the tribes of Athens was called *Acamantides* from him, by the appointment of the oracle; and he founded a city in Phrygia Major, called *Acamantium*. Homer mentions two other heroes of this name; one a Thracian prince who came to succour Priam, another a son of Antenor.

ACANACEOUS PLANTS, such as are armed with prickles.

ACANGIS, that is, *Ravagers* or *Adventurers*; a name which the Turks give their hussars or light-

troops, who are generally sent out in detachments to procure intelligence, harass the enemy, or ravage the country.

ACANTHA, in botany, the prickly of any plant; in zoology, a term for the spine or prickly fins of fishes.

ACANTHABOLUS, in surgery, an instrument for pulling thorns, or the like, out of the skin.

ACANTHINE, any thing resembling or belonging to the herb acanthus. Acanthine garments, among the ancients, are said to be made of the down of thistles; others think they were garments embroidered in imitation of the acanthus.

ACANTHOPTERYGIOUS FISHES, a term used by Linnaeus and others for those fishes whose back-fins are hard, osseous, and prickly.

ACANTHOS, a town of Egypt, near Memphis, (Pliny); now *Bisalta*. Also a maritime town of Macedonia, to the west of mount Athos, a colony of Andrians (Thucydides, Ptolemy); now *Erisso*; near which was shown Xerxes's ditch, of seven stadia, in order to separate mount Athos from the continent, and convey his ships, without doubling Athos, into the Singitic Bay. *Acanthos* is also a town of Epirus.

ACANTHUS, BEAR'S-BREECH, or *Brank-ursine*, in botany: A genus of the angiospermia order, belonging to the didynamia class of plants; and ranking in the 40th natural order, *Personatæ*. The generic characters are: The *calyx* is a perianthium with leaflets of three alternate pairs unequal and persistent: The *corolla* is one-petal'd and unequal; the tubus very short, closed with a beard; no upper-lip, the under one very large, flat, straight, very broad, three lobed, and obtuse: The *stamina* have four subulated filaments shorter than the corolla; the two superior rather longer, recurvate, and incurved at the top; the antheræ are oblong, compressed, obtuse, lateral, parallel, and villous before: The *pistillum* has a conic germen; a filiform stylus, the length of the stamina; and two acute lateral stigmata: The *perianthium* is an acutely-ovated bilocular capsule, with a lateral partition: The *seeds* one or two, fleshy and gibbous.

Species. 1. The mollis, or common bear's breech, a native of Italy, is the sort that is used in medicine, and is supposed to be the *mollis acanthus* of Virgil; and the leaves are famous for having given rise to the capital of the Corinthian pillars. 2. The spinosus, or prickly bear's-breech; the leaves of which are deeply jagged in very regular order, and each segment is terminated with a sharp spine, as are also the footstalks of the leaves and the empalement of the flower, which renders it troublesome to handle them. 3. Illicifolius, or shrubby bear's-breech, grows naturally in both the Indies. It is an evergreen shrub, which rises about four feet high; and is divided into many branches, garnished with leaves like those of the common holly, and armed with spines in the same manner: the flowers are white, and shaped like those of the common acanthus, but smaller. 4. The nigra, or Portugal bear's-breech, with smooth sinuated leaves of a livid green colour, was discovered in Portugal by Dr Jussieu of the royal garden at Paris. 5. The middle bear's-breech, with entire leaves, having spines on their border, is supposed to be the acanthus of Dioscorides.

Culture,

Acantha
||
Acanthus.

Acanthus

Acarauna.

Culture, &c. They are all perennial plants. The first and second species may be propagated either by seeds, or by offsets from the roots. The best way is to raise them from the seeds; which should be sown about the end of March, in a light soil. They are best dropped at distances into shallow drills, and covered three quarters of an inch with mould. When the plants are come up, the strongest should be marked, and the rest should be pulled up, that they may stand at a yard distance one from another. They require no other culture but to keep them clear from weeds. The third, fourth, and fifth sorts are propagated only by seeds; which, as they do not ripen in Europe, must be obtained from the places in which they grow naturally: the plants are so tender, that they cannot be preserved out of the stove in this country.—The first species is the sort used in medicine. All the parts of it have a soft sweetish taste, and abound with a mucilaginous juice: its virtues do not seem to differ from those of althea and other mucilaginous plants.

ACANTHUS, in architecture, an ornament representing the leaves of the acanthus, used in the capitals of the Corinthian and Composite orders.

ACAPULCO, a considerable town and port in Mexico, on the South Sea. It has a fine harbour, from whence a ship annually sails to Manila in the Philippine islands, near the coast of China in Asia; and another returns annually from thence with all the treasures of the East Indies, such as diamonds, rubies, sapphires, and other precious stones; the rich carpets of Persia; the camphire of Borneo; the benjamin and ivory of Pegu and Cambodia; the silks, muslins, and calicoes, of the Mogul's country; the gold-dust, tea, china-ware, silk, and cabinets, of China and Japan; besides cinnamon, cloves, mace, nutmegs, and pepper; inasmuch that this single ship contains more riches than many whole fleets. The goods brought to Acapulco are carried to the city of Mexico by mules and pack-horses; and from thence to Vera Cruz on the North Sea, in order to be shipped for Europe. Acapulco itself is a small place, consisting of about 2 or 300 thatched houses. Ships arrive at the port by two inlets, separated from each other by a small island; the entrance into them in the day-time is by means of a sea-breeze, as the sailing out in the night-time is effected by a land-breeze. A wretched fort, 42 pieces of cannon, and a garrison of 60 men, defend it. It is equally extensive, safe, and commodious. The basin which constitutes this harbour is surrounded by lofty mountains, which are so dry, that they are even destitute of water. The air here is hot, heavy, and unwholesome; to which none can habituate themselves, except certain negroes that are born under a similar climate, or some mulattoes. This feeble and miserable colony is crowded with a vast accession to its numbers upon the arrival of the galleons; traders flocking here from all the provinces of Mexico, who come to exchange European toys, their own cochineal, and about ten millions* of silver for spices, muslins, printed linens, silk, perfumes, and the gold works of Asia. W. Long. 102. 29. N. Lat. 17. 30.

*L. 437,500 Sterling.

ACARAI, a town of Paraguay in South America, built by the Jesuits in 1624. Long. 116. 40. S. Lat. 26'.

ACARAUNA, a small American fish, called by our sailors *the old-wife*. See LABRUS.

Nº 2.

ACARNANIA, the first country of Free Greece, or Greece Proper, bounded on the west by the Sinus Ambracius, and separated from Ætolia by the river Achelous on the east, and by the Sinus Ambracius from Epirus. The people were called *Acarnanes*, denoting persons unshorn; other Ætolians, to the east of the Achelous, being called *Curetes* (Homer) from being shorn. According to Lucian, they were noted for effeminacy and incontinence; hence the proverb, *Porcellus Acarnanius*. This country was famous for an excellent breed of horses; so that *Ἀκαρνικός ἵππος*, is a proverbial saying for a thing excellent in its kind. It is now called *la Carnia* and *il Despotato*.

ACARON, or ACCARON, a town of Palestine, called *Ekron* in Scripture. It was the boundary of the Philistines to the north; stood at some distance from the sea, near Bethshemesh; and was famous for the idol of Baalzebub.

ACARUS, the TICK or MITE, a genus of insects belonging to the order of aptera, or such as have no wings. The acarus has eight legs; two eyes, one on each side of the head; and two jointed tentacula. The female is oviparous. Linnæus enumerates 35 species; of which some are inhabitants of the earth, some of waters; some live on trees, others among stones, and others on the bodies of other animals, and even under the skin. The description of a few of the most remarkable will here suffice.

1. The fire, or cheese-mite, is a very minute species. To the naked eye, these mites appear like moving particles of dust; but the microscope discovers them to be perfect animals, having as regular a figure, and performing all the functions of life as perfectly, as creatures that exceed them many times in bulk. The principal parts of them are the head, the neck, and the body. The head is small in proportion to the body; and has a sharp snout, and a mouth that opens and shuts like a mole's. They have two small eyes, and are extremely quicksighted; and when they have been once touched with a pin, you will easily perceive how cunningly they avoid a second touch. Their legs are each furnished at the extremity with two little claws, with which the animal very nicely takes hold of any thing. The hinder part of the body is plump and bulky; and ends in an oval form, from which there issue out a few exceeding long hairs. Other parts of the body are also beset with thin and long hairs. The males and females are easily distinguished in these little animals. The females are oviparous, as the louse and spider; and from their eggs the young ones are hatched in their proper form, without having any change to undergo afterwards. They are, however, when first hatched, extremely minute; and, in their growing to their full size, they cast their skins several times. These little creatures may be kept alive many months between two concave glasses, and applied to the microscope at pleasure. They are thus often seen *in coitu*, conjoined tail to tail; and this is performed by an incredibly swift motion. Their eggs, in warm weather, hatch in 12 or 14 days; but in winter they are much longer. These eggs are so small, that a regular computation shows, that 90 millions of them are not so large as a common pigeon's egg*. They are very voracious animals, and have often been seen to eat one another. Their manner of eating is by thrusting alternately one jaw

Acarnania

Acarnus.

*Baker's

Microscope,

p. 187.

Acarus. jaw forward and the other backward, and in this manner grinding their food; and after they have done feeding, they seem to chew the cud.—There are several varieties of this species found in different substances besides cheese; as in malt-dust, flour, oatmeal, &c. Those in malt-dust and oatmeal are much nimbler than the cheese-mites, and have more and longer hairs. There are also a sort of wandering mites, which range wherever there is any thing they can feed on: They are often seen in the form of a white dust, and are not suspected to be living creatures.—The mite is called by authors simply, *Acarus*. It is an animal very tenacious of life, and will live months without food. Mr Lewenhoeck* had one which lived 11 weeks on the point of a pin, on which he had fixed it for examining by his microscope.

* *Arcan.*
Nat. tom. iv.
p. 368.

2. The sanguifugus. The hinder part of the abdomen is crenated, the scutellum is oval and yellowish, and the beak is trifid. It is a native of America, and sticks so fast on the legs of travellers, sucking their blood, that they can hardly be extracted.

3. The telarius is of a greenish yellow colour. It has a small sting or weapon, with which it wounds the leaves of plants, and occasions them to fold backward. They are very frequently to be met with in the autumn, inclosed in the folded leaves of the lime-tree.

4. The exulcerans, or itch-acarus, is a very small species: its body is of a figure approaching to oval, and lobated; the head is small and pointed; its colour is whitish, but it has two dusky semicircular lines on the back. It has long setaceous legs, but the two first are short. It is found in the pustules of the itch: authors in general have supposed that it causes that disease: but others observe, that if this were so, it would be found more universally in those pustules. It is more probable that these only make a proper nidus for it. See, however, the article *ITCH*.

5. The batatas is of a blood-colour, and a little rough; the fore pair of legs are as long as the body. It inhabits the potatoes of Surinam.

6. The ovinus, or sheep-tick, has a flat body, of a roundish figure, but somewhat approaching to oval, and of a yellowish white colour, and has a single large round spot on the back: the anus is visible in the lower part of the body; the thorax is scarce conspicuous; the head is very small and black; the mouth is bifid: the antennæ are of a clavated figure, and of the length of the snout; the legs are short and black. It is common on sheep, and its excrements stain the wool green: it will live in the wool many months after it is shorn from the animal.

7. The coleopratorum, or acarus of insects, is extremely minute: its body is round, reddish, and covered with a firm and hard skin; the head is very small, the neck scarce visible; the legs are moderately long, the anterior pair longer than the others; it has a whiteness about the anus. It is frequent on the bodies of many insects, which it infests, as the louse does others; it runs very swiftly: the humble-bee and many other of the larger insects, are continually infested with it; but none so much as the common black beetle, which has thence been called the lousy beetle.

8. The baccarum, or scarlet-tree mite, is a small species: its body is roundish, and the back not at all flattened, as it is in many others; the skin is smooth,

VOL. I. Part I.

shining, and glossy; and the whole animal seems distended, and ready to burst; the colour is a bright red, but a little dusky on the sides than elsewhere: the head is very small, and the legs short; there is on each side a small dusky spot near the thorax, and a few hairs grow from different parts of the body. It is very common on trees, particularly on the currant, on the fruit of which we frequently see it running.

9. The longicornis, or red stone-acarus, is very small, and of a bright red colour; the body is round, and distended; the head is very small and pointed; the legs are moderately long, and of a paler red than the body: the antennæ are much longer than in any other species. It is frequent about old stone-walls and on rocks, and runs very nimbly. See Plate I.

10. The aquaticus is a small species: the body is of a figure approaching to an oval, and the back appears depressed; it is of a bright and strong scarlet colour. The head is small; the legs are moderately long and firm, and are of a paler red than the body. It is common in shallow waters, where it runs very swiftly along the bottom. Its diminutiveness hinders the beauty of its colours from being perceived, as they are not discernible without the microscope.

11. The holosericeus is a small species: its body is roundish, but a little approaching to oval; the back somewhat depressed: it is of a fine scarlet colour, and covered with a velvety down. The head is very small; the eyes are two, and very small; the legs are short and of a paler red, and there is a small black spot near the insertion of the anterior ones. It is very common under the surface of the earth, and sometimes on herbs and among hay. It is supposed to be poisonous if swallowed; but we do not seem to have any certain account of such an effect.

12. The longipes is the largest of the acarus kind: its body is roundish, of a dusky brown on the back, with a dusky spot of a rhomboidal figure near the middle of it; the belly is whitish; the legs are extremely long and slender. On the back part of the head there stands a little eminence, which has on it a kind of double crest, formed as it were of a number of minute spines: the eyes are small and black, and are two in number. It is very common in our pastures towards the end of summer. Ray and Lister call it *araneus crustatus longipes*; Mouffet, *araneus longipes*; and, notwithstanding its having but two eyes, it has been almost universally ranked among the spiders.

ACASTUS, in classic history, the son of Pelias king of Thessaly, and one of the most famous hunters of his time, married Hippolyta, who falling desperately in love with Peleus her son-in-law, and he refusing to gratify her wishes, she accused him to her husband of a rape; on which he slew them both.

ACATALECTIC, a term, in the ancient poetry, for such verses as have all their feet or syllables, in contradistinction to those that have a syllable too few.

ACATALEPSY, signifies the impossibility of comprehending something.—The distinguishing tenet of the Pyrrhonists was their asserting an absolute acatalepsy in regard to every thing.

ACATERY, or ACCATRY, anciently an officer of the king's household, designed for a check betwixt the clerks of the kitchen and the purveyors.

G

ACA-

Acarus
||
Acateri.

Acatharsia
||
Acceler-
ation.

ACATHARSIA, in medicine, an impurity of the blood or humours.

ACATHISTUS, the name of a solemn hymn anciently sung in the Greek church on the Saturday of the fifth week of Lent, in honour of the Virgin, for having thrice delivered Constantinople from the invasions of the barbarous nations.

ACATIUM, in the ancient navigation, a kind of boat or pinnace used for military purposes. The *acatium* was a species of those vessels called *naves actuariæ*, i. e. such as were wrought with oars. It was sometimes made use of in battle. Strabo describes it as a privateer or pirate sloop.

AGAULIS, in botany, a term applied to certain plants, the flowers of which have no pedicle or stalk to support them, but rest immediately on the ground, such as the carline thistle, &c.

ACCA (St), bishop of Hagustaldt, or Hexam, in Northumberland, succeeded Wilfrid in that see in 709. He ornamented his cathedral in a most magnificent manner: he furnished it also with plate and holy vestments; and erected a noble library, consisting chiefly of ecclesiastical learning, and a large collection of the lives of the saints, which he was at great pains to procure.—He was accounted a very able divine, and was famous for his skill in church-music. He wrote several pieces: particularly, *Passiones Sanctorum*, the Sufferings of the Saints: *Pro illustrandis scripturis*, ad Bedam; For explaining the scriptures, addressed to Bede. He died in 740, having enjoyed the see of Hexam 31 years, under Egbert king of the Northumbrians.

ACCALIA, in Roman antiquity, solemn festivals held in honour of Acca Laurentia, Romulus's nurse: they were otherwise called LAURENTALIA.

ACCAPITARE, in law, the act of becoming vassal of a lord; or of yielding him homage and obedience. Hence,

ACCAPITUM, signifies the money paid by a vassal upon his admission to a feu.

ACCAPITUM, in our ancient law, was used also to express the relief due to the chief lord. See RELIEF.

ACCEDAS AD CURIAM, in the English law, a writ lying, where a man has received, or fears, false judgment in an inferior court. It lies also for justice delayed, and is a species of the writ RECORDARE.

ACCELERATION, in mechanics, the increase of velocity in a moving body. Accelerated motion is that which continually receives fresh accessions of velocity. Acceleration stands directly opposed to *retardation*, which denotes a diminution of velocity.

ACCELERATION is chiefly used in physics, in respect of falling bodies, i. e. of heavy bodies tending towards the centre of the earth by the force of gravity. That natural bodies are accelerated in their descent, is evident from various considerations, both *à priori* and *posteriori*.—Thus, we actually find, that the greater height a body falls from, the greater impression it makes, and the more vehemently does it strike the subject plane, or other obstacle.

Various were the systems and opinions which philosophers produced to account for this acceleration. But the immediate cause of acceleration is now sufficiently obvious; the principle of gravitation, which determines the body to descend, determining it to be accelerated by a necessary consequence.

Suppose a body let fall from on high: the primary cause of its beginning to descend is doubtless the power of gravity; but when once the descent is commenced, that state becomes in some measure natural to the body; so that if left to itself, it would persevere in it for ever, even though the first cause should cease: as we see in a stone cast with the hand, which continues to move after it is left by the cause that gave it motion. But, beside the propensity to descend impressed by the first cause, and which of itself were sufficient to continue the same degree of motion, once begun, *in infinitum*; there is a constant accession of subsequent efforts of the same principle, gravity, which continues to act on the body already in motion, in the same manner as if it were at rest. Here, then, being a double cause of motion; and both acting in the same direction, viz. directly towards the centre of the earth; the motion they jointly produce must necessarily be greater than that of any one of them.—And the velocity thus increased having the same cause of increase still persisting, the descent must necessarily be continually accelerated.

The motion of a body ascending, or impelled upwards, is diminished or retarded from the same principle of gravity, acting in a contrary direction, in the same manner as a falling body is accelerated: See RETARDATION. A body thus projected upwards, rises till it has lost all its motion: which it does in the same time that a body falling would have acquired a velocity equal to that wherewith the body was thrown up. Hence the same body thrown up, will rise to the same height from which falling it would have acquired the velocity wherewith it was thrown up: And hence the heights which bodies thrown up with different velocities do ascend to, are to one another as the squares of those velocities.

ACCELERATION of Bodies on inclined Planes. The same general law obtains here as in bodies falling perpendicularly: the effect of the plane is to make the motion slower; but the inclination being every where equal, the retardation arising therefrom will proceed equally in all parts, at the beginning and the ending of the motion. See MECHANICS.

ACCELERATION of the Motion of Pendulums.—The motion of pendulous bodies is accelerated in their descent; but in a less ratio than that of bodies falling perpendicularly. See MECHANICS and PENDULUM.

ACCELERATION of the Motion of Projectiles. See PROJECTILE.

ACCELERATION is also applied in the ancient astronomy, in respect of the fixed stars.—This acceleration was the difference between the revolution of the *primum mobile* and the solar revolution; which was computed at three minutes and 56 seconds.

ACCELERATION of the Moon, a term used to express the increase of the moon's mean motion from the sun, compared with the diurnal motion of the earth; so that it is now a little swifter than it was formerly. Dr Halley was the first who made this discovery; and he was led to it by comparing the ancient eclipses observed at Babylon with those observed by Albatennius in the ninth century, and some of his own time. He was not able to ascertain the quantity of this acceleration, because the longitudes of Bagdad, Alexandria, and Aleppo, where the observations were made, had not been.

Acceler-
ation.

Acceleration been accurately determined. But since his time the longitude of Alexandria has been ascertained by Chazelles; and Babylon, according to Ptolemy's account, lies 50' east from Alexandria. From these data, Mr Dunthorne compared several ancient and modern eclipses, with the calculations of them, by his own tables, and hereby verified Dr Halley's opinion; for he found that the same tables represent the moon's place more backward than her true place in ancient eclipses, and more forward than her true place in later eclipses; and thence justly inferred, that her motion in ancient times was slower; in later times quicker, than the tables give it. But he did not content himself with merely ascertaining the fact; he proceeded to determine the quantity of the acceleration; and by means of the most ancient eclipse of which any authentic account remains, observed at Babylon in the year before Christ 721, he concluded, that the observed beginning of this eclipse was not above an hour and three-quarters before the beginning by the tables; and therefore the moon's true place could precede her place by computation but little more than 50' of a degree at that time. Admitting the acceleration to be uniform, and the aggregate of it as the square of the time, it will be at the rate of about 10' in 100 years.

Dr Long attributes the acceleration above described to one or more of these causes: either, 1. The annual and diurnal motion of the earth continuing the same, the moon is really carried round the earth with a greater velocity than heretofore: or, 2. The diurnal motion of the earth, and the periodical revolution of the moon continuing the same, the annual motion of the earth round the sun is a little retarded; which makes the sun's apparent motion in the ecliptic a little slower than formerly; and, consequently, the moon in passing from any conjunction with the sun, spends less time before she again overtakes the sun, and forms a subsequent conjunction: in both these cases, the motion of the moon from the sun is really accelerated, and the synodical month actually shortened. Or, 3. The annual motion of the earth, and the periodical revolution of the moon continuing the same, the rotation of the earth round its axis is a little retarded: in this case, days, hours, minutes, seconds, &c. by which all periods of time must be measured, are of a longer duration; and consequently the synodical month will appear to be shortened, though it really contains the same quantity of absolute time as it always did. If the quantity of matter in the body of the sun be lessened by the particles of light continually streaming from it, the motion of the earth round the sun may become slower: if the earth increases in bulk, the motion of the moon round the earth may be quickened thereby. See ASTRONOMY.

ACCELERATOR, in anatomy, the name of two muscles of the penis, which serve for ejecting the urine or semen. See ANATOMY, *Table of the Muscles*.

ACCIDENTES, a lower order of ministers in the Romish church, whose office is to light and trim the candles.

ACCENDONES, in Roman antiquity, a kind of gladiators, whose office was to excite and animate the combatants during the engagement. The orthography of the word is contested: the first edition of Tertullian, by Rhenanus, has it *accedones*; an ancient

manuscript, *accendones*. Aquinas adheres to the former, Pitiscus to the latter. The origin of the word, supposing it *accendones*, is from *accendo*, I kindle; supposing it *accedones*, from *accedo*, I accede, am added to. The former places their distinguishing character in enlivening the combat by their exhortations and suggestions; the latter supposes them to be much the same with what among us are called *seconds*, among the Italians *patroni*: excepting that these latter only stand by to see the laws of the sword duly observed, without intermeddling to give advice or instruction.

ACCENSI, in the Roman armies, certain supernumerary soldiers, designed to supply the places of those who should be killed or anywise disabled. They were thus denominated, *quia accensebantur*, or *ad censum adjiciebantur*. Vegetius calls them *supernumerarii legionum*. Cato calls them *ferentarii*, in regard they furnished those engaged in battle with weapons, drink, &c. Though Nonnius suggests another reason of that appellation, viz. because they fought with stones, slings, and weapons *que ferruntur*, such as are thrown, not carried in the hand. They were sometimes also called *velites*, and *velati*, because they fought clothed, but not in armour; sometimes *adscripticii*, and *adscriptivi*; sometimes *rorarii*. The *accensi*, Livy observes, were placed at the rear of the army, because no great matter was expected from them: they were taken out of the fifth class of citizens.

ACCENSI, in antiquity, denotes an inferior order of officers, appointed to attend the Roman magistrates, somewhat in the manner of ushers, serjeants, or tipstaves among us. They were thus called from *accire*, to send for; one part of their office being to call assemblies of the people, summon parties to appear and answer before the judges, &c.

ACCENSI, was also an appellation given to a kind of adjutants, appointed by the tribune to assist each centurion and decurion. In which sense, *accensus* is synonymous with *optio*. In an ancient inscription, given by a Torre, we meet **ACCENSUS** **EQUITUM** **ROMANORUM**; an office no where else heard of. That author suspects it for a corruption; and instead thereof reads, **A CENSIBUS**.

ACCENSION, the action of setting a body on fire: thus the accension of tinder is effected by striking fire with flint and steel.

ACCENT, in reading or speaking, an inflection of the voice, which gives to each syllable of a word its due pitch in respect of height or lowness. See **READING**. The word is originally Latin, *accentus*: a compound of *ad*, to; and *cano*, to sing. *Accentus*, *quasi adcantus*, or *juxta cantum*. In this sense, accent is synonymous with the Greek *ῥυθμός*; the Latin *tenor*, or *tonor*; and the Hebrew *גוֹשֵׁל* *gush*, taste.—For the doctrine of *Accents* in *Composition*, see *Poetry*, Part III. No 103, 114.

ACCENT, among grammarians, is a certain mark or character placed over a syllable, to direct the stress of its pronunciation. We generally reckon three grammatical accents in ordinary use, all borrowed from the Greeks, viz. the *acute accent*, ('), which shows when the tone of the voice is to be raised. The *grave accent* (``), when the note or tone of the voice is to be depressed. The *circumflex accent* (ˆ or ^), is composed of both the acute and the grave, and points out a kind

Accenti
||
Accent.

Accent. of undulation of the voice. The Latins have made the same use of these three accents.

The Hebrews have a grammatical, a rhetorical, and musical accent: though the first and last seem, in effect, to be the same; both being comprised under the general name of *tonic accents*, because they give the proper tone to syllables; as the rhetorical accents are said to be euphonic, because as they tend to make the pronunciation more sweet and agreeable. There are four euphonic accents, and 25 tonic; of which some are placed above, and others below the syllables; the Hebrew accents serving not only to regulate the risings and fallings of the voice, but also to distinguish the sections, periods, and numbers of periods, in a discourse; and to answer the same purposes with the points in other languages. Their accents are divided into *emperors, kings, dukes, &c.* each bearing a title answerable to the importance of the distinction it makes. Their emperor rules over a whole phrase, and terminates the sense completely; answering to our point. Their king answers to our colon; and their duke to our comma. The king, however, occasionally becomes a duke, and the duke a king, as the phrases are more or less short. It must be noted, by the way, that the management and combination of these accents differ in Hebrew poetry from what they are in prose. The use of the tonic or grammatical accents has been much controverted: some holding that they distinguish the sense; while others maintain that they are only intended to regulate the music, or singing; alleging that the Jews sing, rather than read, the scriptures in their synagogues*. Be this, however, as it will, it is certain the ancient Hebrews were not acquainted with these accents. The opinion which prevails amongst the learned, is, that they were invented about the sixth century, by the Jewish doctors of the school of Tiberias, called the *Massoretes*.

As to the Greek accents, now seen both in manuscripts and printed books, there has been no less dispute about their antiquity and use than about those of the Hebrews. Isaac Vossius endeavours to prove them of modern invention; asserting, that anciently they had nothing of this kind, but only a few notes in their poetry, which were invented by Aristophanes the grammarian, about the time of Ptolemy Philopater; and that these were of musical, rather than grammatical use, serving as aids in the singing of their poems, and very different from those introduced afterwards. He also shows from several ancient grammarians, that the manner of writing the Greek accents in these days was quite different from that which appears in our books. The author of *La Methode Greque*, p. 546, observes, that the right pronunciation of the Greek language being natural to the Greeks, it was needless for them to mark it by accents in their writings: so that, according to all appearance, they only began to make use of them so low as the time in which the Romans, being curious to learn the Greek tongue, sent their children to study at Athens, thinking thereby to fix the pronunciation, and to facilitate it to strangers; which happened, as the same author observes, a little before Cicero's time. Wetstein, Greek professor at Basil, in a learned dissertation endeavours to prove the Greek accents of an older standing. He owns that they were not always formed in the same manner by the ancients; but thinks that difference

owing to the different pronunciation which obtained in the different parts of Greece. He brings several reasons, *a priori*, for the use of accents, even in the earliest days: as that they then wrote all in capital letters equidistant from each other, without any distinction either of words or phrases, which without accents could scarce be intelligible; and that accents were necessary to distinguish ambiguous words, and to point out their proper meaning; which he confirms from a dispute on a passage in Homer, mentioned by Aristotle in his *Poëtics*, chap. v. Accordingly, he observes, that the Syrians, who have tonic, but no distinctive accents, have yet invented certain points, placed either below or above the words, to show their mood, tense, person, or sense.

The use of accents, to prevent ambiguities, is most remarkably perceived in some eastern languages, particularly the Siamese and Chinese. Among the people of China, every word, or (which is the same thing) syllable, admits of five accents, as spoken more acutely or remissly; and thus stands for many different things. The same sound *ya*, according to the accent affixed to it, signifies *God, a wall, excellent, stupidity, and a goose*. The Chinese have but 330 spoken words in their language; but these being multiplied by the different accents or tones, which affect the vowels, furnish a language tolerably copious. By means hereof, their 330 simple sounds come to denote 1650 things; but this being hardly sufficient, they are increased further by aspirates added to each word to double the number. The Chinese only reckon four accents: for which the missionaries use the following marks, *á, â, ã, ä*; to which they have added a fifth, thus, *ä*. They make a kind of modulation; wherein, prolonging the duration of the sound of the vowel, they vary the tone, raising and sinking it by a certain pitch of voice: so that their talking is a sort of music or singing. Attempts have been made to determine the quantity of the rise or fall in each accent by means of musical notes; but this is hard to effect, as being different in different persons. Hence the great difficulty of the language to foreigners; they are forced to sing most scrupulously: if they deviate ever so little from the accent, they say quite a different thing from what was intended. Thus, meaning to compliment the person you are talking to with the title *Sir*, you call him a beast with the same word, only a little varied in the tone. Magalhon makes the language the easier to learn on this account.—The Siamese are also observed to sing rather than talk. Their alphabet begins with six characters, all only equivalent to a K, but differently accented. For tho' in the pronunciation the accents are naturally on the vowels, yet they have some to diversify such of their consonants as are in other respects the same.

ACCENT, in music, is a certain enforcement of particular sounds, whether by the voice or instruments, generally used at the beginning of bars.

ACCEPTANCE, in law, a person's agreeing to offers made in bargaining, by which the bargain is concluded.

ACCEPTANCE, in the church of Rome, is put for receiving the pope's constitutions.

ACCEPTANCE, in commerce, is the subscribing, signing, and making one's self debtor for the sum contained in a bill of exchange or other obligation.

ACCEPTATION, in grammar, the sense or meaning wherein any word is taken.

* Cooper, Dom. Mo-
saic. Clav.
p. 37.

Acceptor
||
Accessory.

ACCEPTER, or ACCEPTOR, the person who accepts a BILL of exchange, &c.

ACCEPTILATION, among civilians, an acquittance or discharge given by the creditor to the debtor without the payment of any value.

ACCESSIBLE, something that may be approached, or that access may be had to. Thus we say, Such a place is accessible on one side, &c.

ACCESSION, in law, is a method of acquiring property, by which, in things that have a close connection or dependence upon one another, the property of the principal thing draws after it the property of the accessory: Thus, the owner of a cow becomes likewise the owner of the calf. It sometimes likewise signifies consent or acquiescence.

ACCESSION, among physicians is used for a paroxysm of a disease; among politicians, it signifies a prince's succeeding to the government upon the death of his predecessor.

ACCESSORY, or ACCESSARY, something that accedes, or is added to another more considerable thing; in which sense the word stands opposed to PRINCIPAL.

ACCESSORY, or *Accessory*, in common law, is chiefly used for a person guilty of a felonious offence, not principally, but by participation: as, by advice, command, or concealment.

There are two kinds of *accessories*: *before* the fact, and *after* it.—The *first* is he who commands, or procures another to commit felony, and is not present himself; for if he be present, he is a principal. The *second* is he who receives, assists, or comforts any man that has done murder, or felony, whereof he has knowledge. A man may also be accessory to an accessory, by aiding, receiving, &c. an accessory in felony.

An accessory in felony shall have judgment of life and member, as well as the principal who did the felony; but not till the principal be first attainted, and convicted, or outlawed thereon. Where the principal is pardoned without attainder, the accessory cannot be arraigned; it being a maxim in law, *Ubi non est principalis, non potest esse accessorius*: but if the principal be pardoned, or have his clergy after attainder, the accessory shall be arraigned; 4 and 5 W. et M. cap. 4. And by stat. 1 Anne, cap. 9. it is enacted, that where the principal is convicted of felony, or stands mute, or challenges above 20 of the jury, it shall be lawful to proceed against the accessory in the same manner as if the principal had been attainted; and notwithstanding such principal shall be admitted to his clergy, pardoned, or delivered before attainder. In some cases also, if the principal cannot be taken, then the accessory may be prosecuted for a misdemeanour, and punished by fine, imprisonment, &c. In the lowest and highest offences there are no accessories, but all are principals: as in riots, routs, forcible entries, and other trespasses, which are the lowest offences. So also in the highest offence, which is, according to the English law, high treason, there are no accessories.

Accessories, in petty treason, murder, and in felonies of several kinds, are not to have their clergy. There can be no accessory before the fact in manslaughter; because that is sudden and unpremeditated.

ACCESSORY Nerves, in anatomy, a pair of nerves, which, arising from the medulla in the vertebræ of the neck, ascend, and enter the skull, and pass out of it a-

gain with the par vagum, wrapped up in the same common integument, and after quitting them, are distributed into the muscles of the neck and shoulders. See ANATOMY.

ACCESSORY, among painters, an epithet given to such parts of an history-piece as serve chiefly for ornament, and might have been wholly left out: such as vases, armour, &c.

ACCI, (*anc. geog.*) a town of Tarraconensis, formerly called *Acti*; supposed to be *Guadix*, to the east of the city of Granada, at the foot of a mountain, near the source of the rivulet Guadalantin; now greatly decayed. It is the Colonia Accitana Gemella, and was of some repute among the Roman colonies. The people were called Gemellenes, because the colony consisted of colonists from the third and sixth legions.

ACCIAIOLI (Donata), a man famous for his learning and the honourable employments he possessed in Florence his native country, in the 15th century. He wrote, A Latin translation of some of Plutarch's Lives; Commentaries on Aristotle's Ethics and Politics; and the Life of Charlemagne. He was sent to France by the Florentines, to sue for succour from Lewis XI. against Pope Sixtus IV. but on his journey died at Milan; his body was carried to Florence, and buried in the church of the Carthusians. The small fortune he left his children is a proof of his probity and disinterestedness. His daughters, like those of Aristides, were married at the public expence, as an acknowledgment of his services. His funeral eulogium was spoken by Christopher Landini; and an elegant epitaph, by Politian, was inscribed on his tomb.

ACCIDENT, in a general sense, denotes any casual event.

ACCIDENT, among logicians, is used in a threefold sense. 1. Whatever does not essentially belong to a thing; as the clothes a man wears, or the money in his pocket. 2. Such properties in any subject as are not essential to it; thus whiteness in paper is an accidental quality. 3. In opposition to substance, all qualities whatever are called accidents; as sweetness, softness, &c.

ACCIDENT, in grammar, implies a property attached to a word, without entering into its essential definition; for every word, notwithstanding its signification, will be either primitive, derivative, simple, or compound, which are the accidents of words. A word is said to be primitive, when it is taken from no other word in the language in which it is used: thus *heaven, king, good*, are primitive words. It is said to be derivative, when it is taken from some other word: thus *heavenly, kingdom, goodness*, &c. are derivatives. A simple word is easily distinguished from a compound: thus *just, justice*, are simple words; *unjust, injustice*, are compound: *res* is a simple word, as well as *publica*; but *respublica* is a compound. Besides these accidents, which are common to all sorts of words, each particular species has its accidents: thus the accidents of the noun substantive are the gender, declension, and number; and the adjective has another accident, namely, the comparison. See the article GRAMMAR and LANGUAGE.

ACCIDENT, in heraldry, an additional point or mark in a coat of arms, which may be either omitted or retained without altering the essence of the armour; such as, abatement, difference, and tincture.

ACCI-

Accessory
||
Accident.

Accidental,
Accipenser.

ACCIDENTAL, in a general sense, implies something that happens by accident, or that is not essential to its subject.

ACCIDENTAL, in philosophy, is applied to that effect which flows from some cause intervening by accident, without being subject, or at least without any appearance of being subject, to general laws or regular returns. In this sense, *accident* is opposed to *constant* and *principal*. Thus the sun's place is, with respect to the earth, the constant and principal cause of the heat in summer and the cold in winter; whereas winds, snows, and rains, are the accidental causes which often alter and modify the action of the principal cause.

ACCIDENTAL Point, in perspective, is that point in the horizontal line where the projections of two lines parallel to each other meet the perspective plane.

ACCIDENTAL Colours, are those which depend upon the affections of the eye, in contradistinction to those which belong to the light itself. The impressions made upon the eye by looking steadfastly at a particular colour are various, according to the single colour or combination of colours in the object; and they continue for some time after the eye is withdrawn, and give a false colouring to other objects. Mr Buffon has endeavoured to trace the connections which these accidental colours have with such as are natural, in a variety of instances. The subject has also been considered by De la Hire and M. Epences; and M. d'Arcy has contrived a machine for determining the duration of the effects of light, and after several trials, finds that it continues about eight thirds of a minute.

ACCIPENSER, in ichthyology, a genus of fishes belonging to the Amphibia Nantes of Linnæus. The accipenser has a single linear nostril: the mouth is in the under part of the head, and contains no teeth; the cirri are below the snout, and before the mouth. There are three species of this genus, viz.

1. The ruthenus has 4 cirri, and 15 squamous protuberances. It is a native of Russia.

2. The huso has 4 cirri; the body is naked, *i. e.* has no prickles or protuberances. The skin of the huso is so tough and strong, that it is employed for ropes in carts and other wheel-carriages; and the ichthyocollo, or ISINGLASS of the shops, famous as an agglutinant, and used also for the fining of wines, is made from its sound or scales. The ancients were acquainted with the fish that afforded this drug. The huso is the largest of the genus, and grows to 24 feet in length. It inhabits the Danube and the rivers of Russia.

3. The sturio, or sturgeon, with 4 cirri and 11 squamous protuberances on the back. This fish annually ascends our rivers, but in no great numbers, and is taken by accident in the salmon-nets. It seems a spiritless fish, making no manner of resistance when entangled, but is drawn out of the water like a lifeless lump. It is seldom taken far out at sea, but frequents such parts as are not remote from the æstuaries of great rivers. It is admired for the delicacy and firmness of its flesh, which is white as veal, and extremely good when roasted. It is generally pickled. The most we receive comes either from the Baltic rivers or North America. Great numbers are taken during summer in the lakes Frischehaff, and Curisch-haff near Pillau, in large nets made of small cord. The adjacent shores are formed into districts, and farmed out to companies of

fishermen, some of which are rented for six thousand guilders, or near three hundred pounds, *per annum*. They are found in vast abundance in the American rivers in May, June, and July; at which time they leap some yards out of the water, and, falling on their sides, make a noise to be heard in still weather at some miles distance. Caviare is made of the rows of this, and also of all the other sorts of sturgeons, dried, salted, and packed up close. Ichthyocollo, or isinglass, is likewise made of the sound of this fish, as well as that of the others; but in very small quantity. The sturgeon grows to a great size, to the length of 18 feet, and to the weight of 500 pounds; but it is seldom taken in our rivers of that bulk. In the manner of breeding, this fish is an exception among the cartilaginous kind; being, like the bony fish, oviparous, spawning in water.

ACCIPITER, the name of Linnæus's first order of birds. See ZOOLOGY.

Among the Romans, the term *accipiter* signified a hawk; and which, from its being very carnivorous, they considered as a bird of bad omen:

Odimus accipitrem, quia semper vivit in armis. OVID.

Pliny, however, tells us, that in some cases, particularly in marriage, it was esteemed a bird of good omen, because it never eats the hearts of other birds; intimating thereby, that no differences in a married state ought to reach the heart. The accipiter was worshipped as a divinity by the inhabitants of Tentyra, an island in the Nile, being considered by them as the image of the sun; and hence we find that luminary represented, in hieroglyphics, under the figure of a hawk.

ACCISMUS, denotes a feigned refusal of something which a person earnestly desires. The word is Latin; or rather Greek, *ἀκκισμός*: supposed to be formed from *Acco*, the name of a foolish old woman noted in antiquity for an affectation of this kind.

Accismus is sometimes considered as a virtue; sometimes as a vice, which Augustus and Tiberius practised with great success. Cromwell's refusal of the crown of England may be brought as an instance of an *Accismus*.

ACCISMUS is more particularly used, in rhetoric, as a species of irony.

ACCITUM (anc. geog.), a town of Hispania Batica, now *Finiana*, as appears from an ancient inscription; situate on an eminence of the mountains Alpujaras in Granada.

ACCIUS (Lucius), a Latin tragic poet, the son of a freedman, and, according to St Jerom, born in the consulship of Hostilius Mancinus and Attilius Serranus, in the year of Rome 583; but there appears somewhat of confusion and perplexity in this chronology. He made himself known before the death of Pacuvius, a dramatic piece of his being exhibited the same year that Pacuvius brought one upon the stage, the latter being then eighty years of age, and Accius only thirty. We do not know the name of this piece of Accius's, but the titles of several of his tragedies are mentioned by various authors. He wrote on the most celebrated stories which had been represented on the Athenian stage; as *Andromache*, *Andromeda*, *Atræus*, *Clytemnestra*, *Medea*, *Meleager*, *Philocletes*, the

Accipiter
||
Accius.

Accius, Acclamation. the civil wars of Thebes, Tereus, the Troades, &c. He did not always, however, take his subjects from the Grecian story; for he composed one dramatic piece wholly Roman: it was intitled *Brutus*, and related to the expulsion of the Tarquins. It is affirmed by some, that he wrote also comedies; which is not unlikely, if he was the author of two pieces, the *Wedding* and the *Merchant*, which have been ascribed to him. He did not confine himself to dramatic writing; for he left other productions, particularly his annals, mentioned by Macrobius, Priscian, Festus, and Nonius Marcellus. He has been censured for writing in too harsh a style, but in all other respects has been esteemed a very great poet. He was so much esteemed by the public, that a comedian was punished for only mentioning his name on the stage. Cicero speaks with great derision of one Accius who had written a history; and, as our author had wrote annals, some insist that he is the person censured: but as Cicero himself, Horace, Quintilian, Ovid, and Paternulus, have spoken of our author with so much applause, we cannot think it is him whom the Roman orator censures with so much severity.

There was also in this age a pretty good orator of the same name, against whom Cicero defended Cluentius. He was born in Pisaurum, and perhaps was a relation of our poet.

Accius, a poet of the 16th century, to whom is attributed *A Paraphrase of Æsop's Fables*, on which Julius Scaliger bestows great encomiums.

ACCLAMATION, a confused noise or shout of joy, by which the public express their applause, esteem, or approbation.

ACCLAMATION, in a more proper sense, denotes a certain form of words, uttered with extraordinary vehemence, and in a peculiar tone somewhat resembling a song, frequent in the ancient assemblies. Acclamations were usually accompanied with applauses, with which they are sometimes confounded: though they ought to be distinguished; as acclamation was given by the voice, applause by the hands; add, that acclamation was also bestowed on persons absent, applause only on those present. Acclamation was also given by women, whereas applause seems to have been confined to men.

Acclamations are of various kinds; ecclesiastical, military, nuptial, senatorial, synodical, scholastic, theatrical, &c. We meet with loud acclamations, musical, and rythmical acclamations; acclamations of joy and respect, and even of reproach and contumely. The former, wherein words of happy omen were used, were also called, *Laudationes, et bona vota*, or good wishes; the latter, *Execrationes et convicia*. Suetonius furnishes an instance of this last kind in the Roman senate, on occasion of the decree for demolishing the statues of Domitian, when the fathers, as the historian represents it, could not refrain from contumelious acclamations of the deceased. The like were shown after the death of Commodus, where the acclamations run in the following strain: *Hosti patriæ honores detrahantur, parricidæ honores detrahantur; hostis statuas undique, parricidæ statuas undique, gladiatoris statuas undique, &c.*—The formula, in acclamations, was repeated sometimes a greater, sometimes a lesser, number of times. Hence we find in Roman writers, *acclamatum est quinquies, et vices*; five times, and twenty times: sometimes also *sexagies*; and even *octuagies*, sixty and eight times.

Acclamations were not unknown on the theatres in the earliest ages of the Roman commonwealth; but they were artless then, and little other than confused shouts. Afterwards they became a sort of regular concerts. That mentioned by Phædrus, *latere incolumis Roma salvo principe*, which was made for Augustus, and proved the occasion of a pleasant mistake of a flute-player called *Princeps*, shows that musical acclamations were in use in that emperor's reign. *Revertentem ex Provincia modulatis carminibus prosequabantur*, says Suetonius, who gives another instance in the time of Tiberius: a false report of Germanicus's recovery being spread through Rome, the people ran in crowds to the capitol with torches and victims, singing, *Salva Roma, Salva Patria, Salvus est Germanicus*.—Nero, passionately fond of music, took special care to improve and perfect the music of acclamations. Charmed with the harmony wherewith the Alexandrians, who came to the games celebrated at Naples, had sung his praises, he brought several over to instruct a number of youth, chosen from among the knights and people, in the different kinds of acclamations practised at Alexandria. These continued in use as long as the reign of Theodoric. But the people did not always make a single chorus; sometimes there were two, who answered each other alternately: thus, when Nero played on the theatre, Burrhus and Seneca, who were on either hand, giving the signal by clapping, 5000 soldiers called Augustals, began to chant his praise, which the spectators were obliged to repeat. The whole was conducted by a music-master called *Mesochorus* or *Pausanius*.—The honour of acclamations was chiefly rendered to emperors, their children, and favourites; and to the magistrates who presided at the games. Persons of distinguished merit also sometimes received them, of which Quintilian gives us instances in Cato and Virgil. The most usual forms were, *Feliciter, Longiorem vitam, Annos felices*. The actors themselves, and they who gained the prizes in the games of the circus, were not excluded the honour of acclamations.

To theatrical acclamations may be added those of the soldiery and the people in time of triumph. The victorious army accompanied their general to the capitol; and, among the verses they sung in his praises, frequently repeated *IO TRIUMPHÉ*, which the people answered in the same strain. It was also in the way of acclamation that the soldiers gave their general the title of *Imperator* after some notable victory; a title which he only kept till the time of his triumph.

The acclamations of the senate were somewhat more serious than the popular ones; but arose from the same principle, *viz.* a desire of pleasing the prince or his favourites; and aimed likewise at the same end, either to express the general approbation and zeal of the company, or to congratulate him on his victories, or to make him new protestations of fidelity. These acclamations were usually given after a report made by some senator, to which the rest all expressed their consent by crying *OMNES, OMNES*; or else, *EQUUM EST, JUSTUM EST*. Sometimes they began with acclamations, and sometimes ended with them without other debates. It was after this manner that all the elections and proclamations of emperors, made by the senate, were conducted; something of which practice is still retained at modern elections of kings and emperors, where *Vivat Rex,*

Acclama-
tion. *Rex, Vive le Roy, and Long live the King, are custom-
ary forms.*

The Greeks borrowed the custom of receiving their emperors in the public places from the Romans. Luitprand relates, that at a procession where he was present, they sung to the emperor Nicephorus, *πολλὰ ἔτη*; that is, Many years: which Codin expresses thus, by *το ἑλθεῖν το πολυχρονιον*, or by *το πολυχρονιζειν*; and the wish or salutation by *πολυχρονιαμα*. And at dinner, the Greeks then present wished with a loud voice to the emperor and Bardas, *Ut Deus annos multiplicet*; as he translates the Greek. Plutarch mentions an acclamation so loud, upon occasion of Flaminius's restoring liberty to Greece, that the very birds fell from heaven with the shout. The Turks practise something like this on the sight of their emperors and grand viziers to this day.

For the acclamations wherewith authors, poets, &c. were received, who recited their works in public; it is to be observed, the assemblies for this purpose were held with great parade in the most solemn places, as the capitol, temples, the Athenæum, and the houses of great men. Invitations were sent every where, in order to get the greater appearance. The chief care was, that the acclamations might be given with all the order and pomp possible. Men of fortune who pretended to wit, kept able applauders in their service, and lent them to their friends. Others endeavoured to gain them by presents and treats. Philostratus mentions a young man named Vavus, who lent money to the men of letters, and forgave the interest to such as applauded his exercises. These acclamations were conducted much after the same manner as those on the theatre, both as to the music and the accompaniments: they were to be suited both to the subject and to the person. There were particular ones for the philosophers, for orators, for historians, and for poets. It would be difficult to rehearse all the forms of them; one of the most usual was *Sophos*, which was to be repeated three times. Martial comprehends several other usual forms in this verse:

Graviter, Cito, Nequiter, Euge, Beate.

Neither the Greeks nor Romans were barren on this head. The names of gods and heroes were given those whom they would extol. It was not enough to do it after each head of discourse, chiefly after the exordium; but the acclamations were renewed at every fine passage, frequently at every period.

The acclamations wherewith the spectators honoured the victories of the athletes, were a natural consequence of the impetuous motions which attended the gymnastic games. The cries and acclamations of the people, sometimes expressing their compassion and joy, sometimes their horror and disgust, are strongly painted by different poets and orators.

Acclamations made also a part of the ceremony of marriage. They were used for the omen's sake; being the *Lata Omina*, sometimes spoken of before marriage in Roman writers.

Acclamations, at first practised in the theatre, and passing thence to the senate, &c. was in process of time received into the acts of councils, and the ordinary assemblies of the church. The people expressed their approbation of the preacher variously; the more usual forms were, *Orthodox! Third Apostle! &c.* These acclamations being sometimes carried to excess, and often

N^o 2.

misplaced, were frequently prohibited by the ancient doctors, and at length abrogated; though they appear to have been in some use as low as the time of St Bernard.

ACCLAMATION Medals, among antiquaries, such as represent the people expressing their joy in the posture of acclamation.

ACCLIVITY, the rise or ascent of a hill, in opposition to the declivity or descent of it. Some writers in fortification use it for the talus of a rampart.

ACCOLA, among the Romans, signified a person who lived near some place; in which sense, it differed from *incola*, the inhabitant of such a place.

ACCOLADE, a ceremony anciently used in the conferring of knighthood.

Antiquaries are not agreed wherein the accolade properly consisted. The generality suppose it to be the embrace, or kiss, which princes anciently gave the new knight, as a token of their affection: whence the word *accolade*; *q. d.* a clasping, or taking round the neck. Others will rather have it to be a blow on the chine of the neck, given on the same occasion. The Accolade is of some antiquity, in which soever of the two senses it be taken. Greg. de Tours writes, that the kings of France, even of the first race, in conferring the gilt shoulder-belt, kissed the knights on the left cheek. For the *accolée*, or blow, John of Salisbury assures us, it was in use among the ancient Normans: by this it was that William the Conqueror conferred the honour of knighthood on his son Henry. At first, it was given with the naked fist; but was afterwards changed into a blow with the flat of the sword on the shoulder of the knight.

ACCOLEE, sometimes synonymous with *ACCOLADE*, which see.—It is also used in various senses in heraldry: sometimes it is applied to two things joined; at other times, to animals with crowns, or collars about their necks, as the lion in the Ogilvy's arms; and, lastly, to kews, battons, maces, swords, &c. placed saltier-wise behind the shield.

ACCOLTI (Bernardo), secretary to the republic of Florence, was surnamed L'Unico, or the Non-such, probably from the great extent of his understanding, the variety of sciences he had acquired, and the excellency of his poetic vein; which not only gained him a seat among the academicians of the court of Urbino. but made that great Mæcenas, Pope Leo X. in 1520, create him prince of the state of Nepi. He wrote many pieces; among others, a collection of beautiful poems, printed at Venice in 1519 and 1553.

ACCOMMODATION, the application of one thing, by analogy, to another; or the making two or more things agree with one another.

To know a thing by *accommodation*, is to know it by the idea of a similar thing referred thereto.

A prophecy of Scripture is said to be fulfilled various ways; properly, as when a thing foretold comes to pass; and improperly, or by way of *accommodation*, when an event happens to any place or people, like to what fell out some time before to another.—Thus, the words of Isaiah, spoken to those of his own time, are said to be fulfilled in those who lived in our Saviour's; and are *accommodated* to them: "Ye hypocrites, well did Isaiah prophecy of you," &c. which same words St Paul afterwards *accommodates* to the Jews of his time.

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Accomplishment

* Saurin.
Diff. O. T.
tom. i.

† De legib.
Hebr. diff. i.
l. 3. p. 32.

The primitive church *accommodated* multitudes of Jewish, and even heathen ceremonies and practices, to Christian purposes; but the Jews had before done the same by the Gentiles: some will even have circumcision, the tabernacle, brazen serpent, &c. to have been originally of Egyptian use, and only *accommodated* by Moses to the purposes of Judaism*. Spencer maintains, that most of the rites of the old law were an imitation of those of the Gentiles, and particularly of the Egyptians; that God, in order to divert the children of Israel from the worship they paid to the false deities, consecrated the greatest part of the ceremonies performed by those idolaters, and had formed out of them a body of the ceremonial law; that he had indeed made some alterations therein, as barriers against idolatry; and that he thus *accommodated* his worship to the genius and occasions of his ancient people. To this concession of God, according to Spencer†, is owing the origin of the tabernacle, and particularly that of the ark. These opinions, however, have been controverted by later writers.

ACCOMPANIMENT, something attending or added as a circumstance to another, either by way of ornament, or for the sake of symmetry.

ACCOMPANIMENT, in music, denotes the instruments which accompany a voice, in order to sustain it, as well as to make the music more full. The accompaniment is used in recitative as well as in song; on the stage, as well as in the choir, &c. The ancients had likewise their accompaniments on the theatre; they had even different kinds of instruments to accompany the chorus, from those which accompanied the actors in the recitation.—The accompaniment among the moderns, is frequently a different part or melody from the song it accompanies. It is disputed whether it was so among the ancients. It is generally alleged, that their accompaniments went no farther than the playing in octave, or in antiphony to the voice. The Abbé Fraguier, from a passage in Plato, pretends to prove, that they had actual symphony, or music in parts: but his arguments seem far from being conclusive.

ACCOMPANIMENT, in painting, denotes such objects as are added, either by way of ornament, or probability; as dogs, guns, game, &c. in a hunting-piece.

ACCOMPANIMENT, in heraldry, any thing added to a shield by way of ornament; as the belt, mantling, supporters, &c. It is also applied to several bearings about a principal one; as a saltier, bend, fess, chevron, &c.

ACCOMPLICE, one that has a hand in a business; or is privy in the same design or crime with another. See ACCESSORY.

By the law of Scotland, the *accomplice* can only be prosecuted after the conviction of the *principal* offender, unless the accession of the *accomplice* is immediate, in *ipso actu*, so as in effect to render them *co-principal*. By the general rule, the *accomplice* suffers the same punishment with the *principal* offender; yet if he be remarkably less guilty, justice will not permit equal punishment.

The council of Sens, and several other synodical statutes, expressly prohibit the revealing of *accomplices*.

ACCOMPLISHMENT, the entire execution or fulfilling of any thing.

ACCOMPLISHMENT, is principally used in speaking of events foretold by the Jewish prophets in the Old Testament, and fulfilled under the New. We say a

VOL. I. Part I.

literal accomplishment, a mystical or spiritual accomplishment, a single accomplishment, a double accomplishment, a Jewish accomplishment, a Christian, a heathen accomplishment. The same prophecy is sometimes accomplished in all, or in several of those different ways. Thus, of some of the prophecies of the Old Testament, the Jews find a literal accomplishment in their own history, about the time when the prophecy was given: the Christians find another in Christ, or the earliest days of the church; the heathens another, in some of their emperors; the Mahometans another, in their legislator, &c. There are two principal ways of accomplishing a prophecy; *directly*, and by *accommodation*. See ACCOMMODATION, and PROPHECY.

ACCOMPLISHMENT, is also used for any mental or personal endowment.

ACCORD, in painting, is the harmony that reigns among the lights and shades of a picture.

ACCORDS (Stephen Tabourot, seigneur des), advocate in the parliament of Dijon in France, and king's advocate in the bailiwick and chancery of that city, born in the year 1549. He was a man of genius and learning; but too much addicted to trifles, as appears from his piece, intitled, "Les Bigarrures," printed at Paris in 1582. This was not his first production, for he had before printed some sonnets. His work, intitled "Les Touches," was published at Paris in 1585; which is indeed a collection of witty poems, but worked up rather in too loose a manner, according to the licentious taste of that age. His Bigarrures are written in the same strain. He was censured for this way of writing, which obliged him to publish an apology. The lordship of Accords is an imaginary fief or title from the device of his ancestors, which was a drum, with the motto, *à tous accords*, " chiming with all." He had sent a sonnet to a daughter of Mr Begat, the great and learned president of Burgundy, "who (says he) did me the honour to love me:— And inasmuch (continues he), I had subscribed my sonnet with only my device, *à tous accords*, this lady first nicknamed me, in her answer, *Seigneur des Accords*; by which title her father also called me several times. For this reason I chose this surname, not only in all my writings composed at that time, but even in these books." He died July 24th 1561, in the 46th year of his age.

ACCOUNT, or ACCOMPT, in a general sense, a computation or reckoning of any thing by numbers.—Collectively, it is used to express the books which merchants, traders, bankers, &c. use for recording their transactions in business. See BOOK-KEEPING.

Chamber of ACCOUNTS, in the French polity, is a sovereign court of great antiquity, which takes cognisance of and registers the accounts of the king's revenue. It is nearly the same with the English Court of Exchequer.

ACCOUNT is taken sometimes, in a particular sense, for the computation of time: thus we say, The Julian Account, the Gregorian Account, &c. in which sense it is equivalent to *style*.

ACCOUNTANT, or ACCOMPTANT, in the most general sense, is a person skilled in accounts. In a more restricted sense, it is applied to a person, or officer, appointed to keep the accounts of a public company or office; as the South-sea, the India-company, the Bank, the Excise, &c.

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Accountant

Account-
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Accumula-
tion.

ACCOUNTANTSHIP, the art of keeping and balancing accounts. See **BOOK-KEEPING**.

ACCOUNTANT-GENERAL, a new officer in the court of Chancery appointed by act of parliament to receive all moneys lodged in the court instead of the masters, and convey the same to the bank of England for security.

ACCOUTREMENT, an old term applied to the furniture of a soldier, knight, or gentleman.

ACCRETION, in physics, the increase or growth of an organical body, by the accession of new parts. See **NUTRITION**, **PLANTS**, and **VEGETABLES**.

ACCRETION, among civilians, the property acquired in a vague or unoccupied thing, by its adhering to or following another already occupied: thus, if a legacy be left to two persons, one of whom dies before the testator, the legacy devolves to the survivor by right of accretion.

ACCROCHE, in heraldry, denotes a thing's being hooked with another.

ACCUBATION, a posture of the body, between sitting and lying. The word comes from the Latin *accubare*, compounded of *ad*, to, and *cubo*, I lie down. *Accubation*, or *Accubitus*, was the table-posture of the Greeks and Romans; whence we find the words particularly used for the lying, or rather (as we call it) sitting, down to meat. The Greeks introduced this posture. The Romans, during the frugal ages of the republic, were strangers to it: but as luxury got footing, this posture came to be adopted, at least by the men; for as to women, it was reputed an indecency in them to lie down among the men: though, afterwards, this too was got over. But children did not lie down, nor servants, nor soldiers, nor persons of meaner condition, but took their meals sitting, as a posture less indulgent. The Roman manner of disposing themselves at table was this: A low round table was placed in the *cœnaculum*, or dining-room; and, about this, usually three, sometimes only two, beds or couches; according to the number of which, it was called *biclinium* or *triclinium*. These were covered with a sort of bed-clothes, richer or plainer according to the quality of the person, and furnished with quilts and pillows, that the guests might lie the more commodiously. There were usually three persons on each bed; to crowd more, was esteemed forbid. In eating, they lay down on their left sides, with their heads resting on the pillows, or rather on their elbows. The first lay at the head of the bed, with his feet extended behind the back of the second; the second lay with the back of his head towards the navel of the first, only separated by a pillow, his feet behind the back of the third; and so of the third, or fourth. The middle place was esteemed the most honourable. Before they came to table, they changed their clothes, putting on what they called *cenatorii vestis*, the dining-garment; and pulled off their shoes, to prevent fouling the couch.

ACCUBITOR, an ancient officer of the emperors of Constantinople, whose business was to lie near the emperor. He was the head of the youth of the bed-chamber, and had the *cubicularis* and *procubitor* under him.

ACCUMULATION, in a general sense, the act of heaping or amassing things together. Among lawyers, it is used in speaking of the concurrence of several titles

to the same thing, or of several circumstances to the same proof.

ACCUMULATION of Degrees, in an university, is the taking several of them together, or at smaller intervals than usual or than is allowed by the rules of the university.

ACCURSED, something that lies under a curse, or sentence of excommunication.

In the Jewish idiom, *accursed* and *crucified* were synonymous. Among them, every one was accounted *accursed* who died on a tree. This serves to explain the difficult passage in Rom. ix. 3. where the apostle Paul wishes himself *accursed after the manner of Christ, i. e.* crucified, if happily he might by such a death save his countrymen. The preposition *pro* here made use of, is used in the same sense, 2. Tim. i. 3. where it obviously signifies *after the manner of*.

ACCURSIUS, a law-professor in the 13th century, born in Florence. His authority was for some time so great, that he was called the Idol of the Lawyers. — Other three lawyers of note had the same name.

ACCURSIUS (Mariangelus), a famous critic of the 16th century, born at Aquilo in the kingdom of Naples. His *Diatrebes*, printed at Rome in folio, in 1524, on Ovid and Solinus, are a proof of his abilities in that kind of erudition. In his edition of *Amianus Marcellinus* there are five books more than in any of the preceding ones; and he affirms he had corrected 5000 errors in that historian. His predominant passion was the searching for and collecting of old manuscripts: yet he made Latin and Italian verses; was complete master of the French, German, and Spanish tongues; and understood optics and music. He purged himself by oath, being charged for being a plagiarist with regard to his *Ausonius*; it being reported, that he had appropriated to himself the labours of *Fabrizio Varana*, bishop of Camerino.

ACCUSATION, the charging any person with a criminal action, either in one's own name, or in that of the public. The word is compounded of *ad*, to; and *causare*, to plead.

Writers on politics treat of the benefit and the inconveniences of public accusations. Various arguments are alleged, both for the encouragement and discouragement of accusations against great men. Nothing, according to Machiavel, tends more to the preservation of a state, than frequent accusations of persons trusted with the administration of public affairs. This, accordingly, was strictly observed by the Romans, in the instances of Camillus, accused of corruption by Manlius Capitolinus, &c. Accusations, however, in the judgment of the same author, are not more beneficial than calumnies are pernicious; which is also confirmed by the practice of the Romans. Manlius not being able to make good his charge against Camillus, was cast into prison.

By the Roman law, there was no public accuser for public crimes; every private person, whether interested in the crime or not, might accuse, and prosecute the accused to punishment, or absolution. Cato, the most innocent person of his age, had been accused 42 times, and as often absolved. But the accusation of private crimes was never received but from the mouths of those who were immediately interested in them: None (*e. g.*) but the husband could accuse his wife of adultery.

The

Accusative
ii
Acentetum

The ancient Roman lawyers distinguished between *postulatio*, *delatio*, and *accusatio*. For, first, leave was desired to bring a charge against one, which was called *postulare*: then he against whom the charge was laid, was brought before the judge; which was called *deferre*, or *nominis delatio*: lastly, the charge was drawn up and presented, which was properly the *accusatio*. The accusation properly commenced, according to Pædianus, when the *reus* or party charged, being interrogated, denied he was guilty of the crime, and subscribed his name to the *delatio* made by his opponent.

In the *French* law, none but the Procureur general, or his deputies, can form an accusation, except for high-treason and coining, where accusation is open to every body. In other crimes, private persons can only act the part of denouncers, and demand reparation for the offence, with damages.

In *Britain*, by Magna Charta, no man shall be imprisoned or condemned on any accusation, without trial by his peers, or the law; none shall be vexed with any accusation, but according to the law of the land; and no man may be molested by petition to the king, &c. unless it be by indictment or presentment of lawful men, or by process at common law. Promoters of suggestions, are to find surety to pursue them; and if they do not make them good, shall pay damages to the party accused, and also a fine to the king. No person is obliged to answer upon oath to a question whereby he may accuse himself of any crime.

ACCUSATIVE, in the Latin grammar, is the fourth case of nouns, and signifies the relation of the noun on which the action implied in the verb terminates; and hence, in such languages as have cases, these nouns have a particular termination, called *accusative*: as, *Augustus vicit Antonium*, Augustus vanquished Antony. Here *Antonium* is the noun, on which the action implied in the verb *vicit* terminates; and, therefore, must have the accusative termination. Ovid, speaking of the palace of the sun, says, *Materiem superabat opus*, The work surpassed the materials. Here *materiem* has the accusative termination; because it determines the action of the verb *superabat*.—In the English language there are no cases, except the genitive; the relation of the noun being shown by the assistance of prepositions, as *of*, *to*, *from*, &c.

ACCUSIORUM COLONIA (anc. geog.), an inland town in the Cavares, in Gallia Narbonensis: now *Grenoble*, in Dauphiné. See *GRENOBLE*.

ACE, among gamesters, a card or die marked only with one point.

ACELUM, or ACELIUM (anc. geog.), a town of the Venetian territory, now called *Azolo*, situated to the west of Trevigi, at the source of the rivulet Mufone. E. Long. 13°. N. Lat. 45°.

ACENTETUM, or ACANTETA, in natural history, a name given by the ancients to the purest and finest kind of rock-crystal: They used the crystal in many ways; sometimes engraving on it, and sometimes forming it into vases and cups, which were held next in value to the *vasa murrhina* of those times. The crystal they obtained from the island of Cyprus was much esteemed; but often faulty in particular parts, having hairs, cracks, and foulnesses, which they called *salts*, in the middle of the large pieces. Pliny tells us, that when it was used for engraving on, the

artist could conceal all these blemishes among the strokes of his work; but when it was to be formed into cups or precious vases, they always chose the acentetum which had no flaws or blemishes.

Acephali
ii
Acephalous

ACEPHALI, or ACEPHALITÆ, a term applied to several sects who refused to follow some noted leader. Thus the persons who refused to follow either John of Antioch, or St Cyril, in a dispute that happened in the council of Ephesus, were termed *Acephali*, without a head or leader. Such bishops, also, as were exempt from the jurisdiction and discipline of their patriarch, were styled *Acephali*.

ACEPHALI, the levellers in the reign of king Henry I. who acknowledged no head or superior. They were reckoned so poor, that they had not a tenement by which they might acknowledge a superior lord.

ACEPHALOUS, or ACEPHALUS, in a general sense; without a head.

The term is more particularly used in speaking of certain nations, or people, represented by ancient naturalists and cosmographers, as well as by some modern travellers, as formed without heads; their eyes, mouths, &c. being placed in other parts.

Such are the Blemmyes, a nation of Africa near the head of the Niger, represented to be by Pliny and Solinus; *Blemmyes traduntur capita abesse, ore et oculis pectore affixis*. Ctesias and Solinus mention others in India near the Ganges, *sine cervice, oculos in humeris habentes*. Mela also speaks of people, *quibus capita et vultus in pectore sunt*. And Suidas, Stephanus Byzantinus, Vopiscus, and others after them, relate the like. Some modern travellers still pretend to find acephalous people in America.

Several opinions have been framed as to the origin of the fable of the Acephali. The first is that of Thomas Bartholin, who turns the whole into a metaphor; being convinced, that the name Acephali was anciently given to such as had less brain, or conducted themselves less by the rules of prudence, than others. Olearius rather apprehends, that the ancient voyagers, viewing certain barbarous people from the coasts, had been imposed on by their uncouth dress; for that the Samogitians, being short of stature, and going in the severity of winter with their heads covered in hoods, seem at a distance as if they were heedless. F. Lafitau says, that by Acephali are only meant, people whose heads are sunk below their shoulders. In effect, Hulsius, in his epitome of Sir Walter Raleigh's voyage to Guiana, also speaks of a people which that traveller found in the province of Irvipanama, between the lakes of Panama and Cassipa, who had no head or neck; and Hondius, in his map, marks the place with the figures of these monsters. Yet De Laet * rejects the story; being informed by others, that the inhabitants of the banks of the Caora, a river that flows out of the lake of Cassipa, have their head so far sunk between their shoulders, that many believed they had their eyes in their shoulders and their mouths in their breasts.

But though the existence of a nation of *Acephali* be ill warranted, naturalists furnish several instances of individuals born without heads, by some lusus or aberration of nature. Wepfer gives † a catalogue of such acephalous births, from Schenckius, Licetus, Paræus, Wolfius, Mauriceau, &c.

ACEPHALUS, an obsolete term for the tænia or tape-

* Descript. Amer. l. 17. c. 22.
† In Eph. Ger. dec. 1. an. 3. obs. 129. p. 184. Dec. 2. an. 9. obser. 148. p. 258.

Accephalus, tape-worm, which was long supposed to be acephalous. *Acer*, See *TÆNIA*. The first who gave it a head was Tullius; and after him, Fehr: The former even makes it *biceps*, or two headed.

ACEPHALUS, is also used to express a verse defective in the beginning.

ACER, the **MAPLE** or **SYCAMORE TREE**: a genus of the monœcia order, belonging to the polygamia class of plants; and ranking under the 23d Natural Order, *Tribilata*.—The generic characters, both natural and essential, are: The *HERMAPHRODITE calyx* is an acute, coloured, one-leav'd perianthium, divided into five segments, flat and entire at the base, and persistent: The *corolla* is five-petal'd, ovate, and expanding: The *stamina* consist of eight subulated short filaments; the antheræ simple, the dust cruciform: The *pistillum* has a compressed germen, immersed in the receptacle, which is convex, perforated, and large; the stylus is filiform; the stigmata are two, pointed, slender, and reflex: The *pericarpium* consists of two or three capsulæ uniting at the base, roundish, compressed, each terminated with a large membranous wing: The *seeds* are solitary and roundish. The *MALE calyx*, *corolla*, and *stamina*, are the same as in the hermaphrodite: The *pistillum* has no germen nor stylus; the stigma is bifid. [*Nota*, On the first opening of the flower, the *stigma* alone appears; a few days after, the *stylus*.—The hermaphrodite flowers on the same umbel are frequently of two sorts: the inferior ones *feminine*, the antheræ of which do not burst, but the pistillum quickly grows into a fruit: the superior ones *masculine*, of which the antheræ scatter their pollen, but the pistilla without increasing fall off.]

Species, with their uses and properties. 1. The pseudo-platanus, or sycamore, is a very large and beautiful tree, with broad leaves, divided into five lobes serrated in their edges; of a dark-green colour on the upper side, but paler and somewhat hoary underneath; the flowers are very small, and of a greenish white colour. The corolla of this species is scarcely distinguishable from the calyx, and the stamina are long. The fruit is large, and beautifully variegated with green and purple. This species is a native of Germany, but thrives very well in Great Britain, where it is frequent in plantations. It is very proper for making plantations near the sea, or sheltering such as are already too near it; because the sycamore-tree resists the spray of the ocean much better than most other trees. But it has this inconvenience, that its leaves are devoured by insects, so as to become full of holes, and very unsightly; which has caused the planting of it to be much neglected of late. It has, however, long been considered as a timber tree in this country, having been much used by the turners for wooden bowls, dishes, trenchers, &c.; but, since the custom of using earthen ware has become so prevalent, its value for those purposes has greatly decreased. There are two varieties, one with broad leaves and large keys, the other with variegated leaves. By tapping it yields a liquor not unlike that of the birch-tree; from which the Highlanders of Scotland sometimes make an agreeable and wholesome wine.

2. The *campestris*, or common maple, is too well known to need any particular description, as it grows very frequently in hedge-rows in most parts of Britain.

The timber of the common maple is far superior to the beech for all the uses of the turner. When it abounds with knots, as it frequently does, it is highly esteemed by joiners in inlayings. It is also frequently employed for making musical instruments, on account of its lightness; and for the whiteness of its wood was formerly esteemed for making tables, &c. But the principal value of the maple is for underwood; it being of a quick growth, and affording good fuel.

3. The *negundo*, or Virginian ash-leaved maple, is a very strong shooting tree; and in Virginia, where it is a native, is one of the largest trees of this kind. Its leaves are of a pale green, and well adapted to give a variety of tint; but Hanbury says, that this tree ought not to be planted in exposed situations, the branches being subject to be split off by the winds. Its uses are similar to those of the sycamore.

4. The *platanoides*, or Norway maple, grows naturally in Norway, Sweden, and other northern countries of Europe. It rises to a good height, and is well furnished with branches with smooth leaves, of a shining green colour, and beautifully indented. These have an acrid milky juice, which prevents them from being preyed upon by insects as the sycamore is; and as this species resists the spray of the sea equally with the first, it is preferred in plantations situated near the sea. In autumn the leaves dye to a golden yellow colour, which causes a delightful effect at that season when the different tints of decaying vegetables are displayed. The flowers are also beautiful; they come out early in the spring, are of a fine yellow colour, and show themselves to advantage before the leaves come out. They are frequently succeeded by keys, which sometimes arrive at maturity in this country. There is a variety with striped leaves.

5. The *rubrum*, or Virginian scarlet flowering maple, is a native of that country, and never grows to a large size in Britain. It is, however, cultivated in gardens for the beauty of its flowers, which appear in the beginning of April, in roundish bunches, at the bottom of the footstalks of the leaves. The seeds are ripe in five or six weeks after; and ought to be immediately sown, being otherwise very apt to perish. The tree ought to be sheltered, especially whilst young, from the north-east winds; it delights in a moist light soil, where it will thrive much better, as well as produce many more flowers and much better seeds, than in a dry ground. A variety of this tree is known in England by the name of *Sir Charles Wager's Flowering Maple*, from its being first sent from America to Sir Charles Wager. The flowers of this kind come out in larger clusters than the other, and surround the small branches, so that the tree appears entirely covered with them, and makes a much more beautiful appearance than the former, which is now not so much esteemed.

6. The *saccharinum*, or sugar maple, is a large growing tree; will arrive at the height of 40 feet; and has broad thin leaves, divided into five principal parts; which are again indented or cut at the edges into several acute segments. Their surface is smooth, of a light green colour, whitish underneath; and they grow on pretty long footstalks. The flowers come out in the spring, about the time of the Norway maple; and they are succeeded by long keys, which sometimes ripen in England. In America, the inhabitants tap this tree in the spring, boil the liquor, and the feces afford

Acer,
the
Maple-tree.

Acer,
the
Maple-tree.

ford a useful sugar. The sycamore, the ash-leaved, and the Norway maples, also abound with a saccharine juice, from which there is no doubt but a useful sugar might be prepared.

7. The *Pensylvanicum*, or American mountain-maple, very much resembles the sugar-maple, only its leaves are more pointed.

8. The *opalus*, or Italian maple, is very common in most parts of Italy, particularly about Rome; but in Britain is very rarely to be met with, though hardy enough to bear the open air. It is one of the largest species of trees in Italy, and affords a great shade by its numerous and large leaves. On this account it is planted on the road-sides, and near habitations.

9. The *monspesulanum*, or Montpellier maple, is common in the south of France, and in Italy; but is hardly met with in Britain. The leaves resemble those of the common maple; but are of a much thicker substance, a shining green colour, and not so large. They continue in verdure very late in the autumn, which renders the trees more valuable.

10. The *creticum*, or Cretan maple, grows naturally in the Levant; it somewhat resembles the last species; but its leaves are of a much thinner texture, and their footstalks covered with a soft hairy down; whereas those of the other are smooth and soft.

Propagation and culture.—1. By seeds. The first four species are easily propagated in this way. The keys, when ripe in autumn, may be gathered, and in a few days after sown, about an inch and an half deep, in beds of common mould. In spring the plants will appear, and make a shoot of about a foot and an half by the autumn following, if the ground of the seminary be tolerably good, and they are kept free from weeds. The spring after they come up they should be planted in the nursery in rows two feet and an half asunder, and their distance in the rows must be one foot and an half. Here they may remain till they are big enough to plant out finally, with no further trouble than taking off unsightly side-branches, and such as have a tendency to make the tree forked, except digging between the rows, which must always be done every winter.—For the other species, their seeds, as they do not ripen in this country, ought to be procured from the places where they naturally grow, and managed in the following manner: A cool shady part of the seminary should be appropriated for the purpose; the mould should be made fine; beds should be marked out four feet wide, and in length proportionable to the quantity; and in these the seeds should be regularly sown, sifting over them about half an inch of the finest mould. When the plants come up, they must be kept clean from weeds, and frequently watered; and this work must be duly attended to all summer. The next spring, the strongest may be drawn out, and planted in the nursery, in rows two feet asunder, and at the distance of a foot from each other in the rows; leaving the others in the seminary to gain strength. The spring following they also must receive the same culture; and in the nursery they may remain, with no other trouble than keeping the ground clean from weeds in the summer, digging between the rows in the winter, and taking off all strong and irregular side-shoots till they are planted out. Trees raised from seeds will grow faster, and arrive at greater height, than those raised from layers; but they will not pro-

duce such quantities of flowers; which makes the latter method more eligible for those who want these plants for a low shrubbery.—Seeds of the variegated kinds also, when sown, will produce variegated plants in return; which renders the propagation of these sorts very expeditious where plenty of seeds may be had. Where these are not to be obtained, the plants are propagated by budding, as afterwards directed.

2. By layers. All the species may be propagated by this method; though it is never practised for the common maple and the sycamore. The young shoots may be at any time laid down in the autumn, winter, or early in the spring. By the autumn following, they will have struck root, and become good plants; when the strongest may be set out in the places where they are to remain; whilst the weakest may be planted in the nursery, like the seedlings, for a year or two, to acquire strength.

3. By cuttings: which method, however, is chiefly practised on the ash-leaved and Norway maples, which more readily take root this way. The cuttings should be the bottom parts of the last year's shoots: They should be taken off early in October, and planted in rows in a moist shady place. The spring and summer following, they must be duly watered as often as dry weather makes it necessary, and be kept clean from weeds. By the autumn they will be fit to remove into the nursery; though if the cuttings are not planted too close, they may remain in their situation for a year or two longer, and then be set out finally, without the trouble of being previously planted in the nursery.

4. By budding, grafting, and inarching. These methods are only practised for the variegated sorts and the large broad-leaved kind. The latter is to be continued no otherwise than by budding it on stocks of the common sycamore; for from the seeds, though so large themselves, only the common sycamore is produced.

In order to propagate these varieties by budding, let some plants of the common sycamore, one year old, be taken out of the seminary, and set in the nursery in rows a yard asunder, and the plants about a foot and a half distance from each other in the rows: Let the ground be kept clean from weeds all summer, and turned in in the winter; and the summer following the stocks will be of a proper size to receive the buds, which should be taken from the most beautifully-striped branches. The best time for this work is the middle or latter end of August. Having then budded your stocks with the eyes or buds fronting the north, early in October take off the bass-matting, which before this time will have confined the bark and pinched the bud, but not so as to hurt it much. Then cut off the stock just above the bud, and dig the ground between the rows. The summer following, keep the ground clean from weeds; cut off all natural side-buds from the stock as they come out; and by autumn, if the land is good, the buds will have shot forth, and formed themselves into trees five or six feet high. They may be then removed into the places where they are designed to remain; or a few of them only may be drawn out, leaving the others to be trained up for larger standards. The striped Norway maple should be budded on stocks of its own kind; for on these they take best, and both kinds are not very liable to run away from their colours. Variegated plants in general must be planted in

Acer,
the
Maple-tree.

Acerb
||
Acetabu-
lum.

poor, hungry, gravelly, or sandy soils, to feed the disease which occasions these beautiful stripes, and cause it to be more powerful. But these trees show their stripes in greater perfection in a good soil: The plant, though in sickness, has the appearance of health; the shoots are vigorous and strong; the leaves are large, less liable to be hurt by insects; and the stripes appear more perfect, natural, and beautiful, than those on stunted trees growing on a poor soil.

ACERB, a four rough astringency of taste, such as that of unripe fruit.

ACERNO, a town of Italy, in the citerior principality of Naples, with a bishop's see. E. Long. 15. 46. N. Lat. 40. 50.

ACERINA, in ichthyology, a name given by Pliny and other of the old naturalists, to the fish we at this time call the *ruffe*. See PERCA.

ACERRA, in antiquity, an altar erected, among the Romans, near the bed of a person deceased, on which his friends daily offered incense till his burial.—The real intention probably was to overcome any offensive smell that might arise about the corps. The Chinese have still a custom like this: they erect an altar to the deceased in a room hung with mourning; and place an image of the dead person on the altar, to which every one that approaches it bows four times, and offers oblations and perfumes.

The *Acerra* also signified a little pot wherein were put the incense and perfumes to be burnt on the altars of the gods and before the dead. It appears to have been the same with what was otherwise called *thuribulum*, and *pyxis*.

We find mention of *Acerræ* in the ancient church. The Jews had also their *Acerræ*, in our version rendered *censers*; and the Romanists still retain them under the name of *incense-pots*. In Roman writers, we frequently meet with *plena acerra*, a full *acerra*: to understand which, it is to be observed, that people were obliged to offer incense in proportion to their estate and condition; the rich in larger quantities, the poor only a few grains; the former poured out *acerræ* full on the altar, the latter took out two or three bits with their fingers.

ACERRA, a town of Italy, in the kingdom of Naples, and in the Terra di Lavoro; seated on the river Agno. E. Long. 15. 10. N. Lat. 40. 55.

ACERRÆ (anc. geog.), the ancient name of a town in the Clanius, in Campania, not far from Naples, now ACERRA.—The name also of another town, now called *la Girola*, in the territory and to the south-east of Lodi, where the rivulet Serio falls into the Adda, to the west of Cremona and north of Placentia.

ACESCENT, a word used to denote any thing which is turning sour, or which is slightly acid. It is only applied properly to the former of these two meanings. The second may be expressed by either of the two words, *acidulous* or *sub-acid*.

ACETABULUM, in antiquity, a measure used by the ancients, equal to one-eighth of our pint. It seems to have acquired its name from a vessel in which acetum or vinegar was brought to their tables, and which probably contained about this quantity.

ACETABULUM, in anatomy, a cavity in any bone for receiving the protuberant head of another, and there-

by forming that species of articulation called ENARTHROSIS.

ACETABULUM, in botany, the trivial name of a species of the peziza, or cup-peziza, a genus belonging to the cryptogamia fungi of Linnæus. It has got the name of *acetabulum*, from the resemblance its leaves bear to a cup. See PEZIZA.

ACETARY. Nehemia Grew, in his anatomy of plants, applies this term to a pulpy substance in certain fruits, e. g. the pear, which is inclosed in a congeries of small calculous bodies towards the base of the fruit, and is always of an acid taste.

ACETOSA, Sorrel; by Linnæus joined to the genus of Dock, under the title of *Rumex*. See RUMEX.

ACETOSELLA, in botany, a species of OXALIS.

ACETOUS, an epithet applied to such substances as are four or partake of the nature of vinegar.

ACETUM, VINEGAR, the vegetable ACID of the chemists. See VINEGAR.

ACHABYTUS (anc. geog.), a high mountain in Rhodes, on the top of which stood a temple of Jupiter.

ACHÆA (anc. geog.), a town of the island of Rhodes, in the district of Jalyfus, and the first and most ancient of all, said to be built by the Heliades, or Grandsons of the Sun.

ACHÆA, a hamlet of Asiatic Sarmatia on the Euxine. The inhabitants were called *Achæi*, a colony of the Orchomenians.

ACHÆANS, the inhabitants of ACHAIA Propria, a Peloponnesian state. This republic was not considerable in early times, for the number of its troops, nor for its wealth, nor for the extent of its territories; but it was famed for its probity, its justice, and its love of liberty. Its high reputation for these virtues was very ancient. The Crotonians and Sybarites, to re-establish order in their towns, adopted the laws and customs of the Achæans. After the famous battle of Leuctra, a difference arose betwixt the Lacedæmonians and Thebans, who held the virtue of this people in such veneration, that they terminated the dispute by their decision. The government of the Achæans was democratical. They preserved their liberty till the time of Philip and Alexander: But in the reign of those princes, and afterwards, they were either subject to the Macedonians, who had made themselves masters of Greece, or oppressed by cruel tyrants. The Achæan commonwealth consisted of twelve inconsiderable towns in Peloponnesus. Its first annals are not marked by any great action, for they are not graced with one eminent character. After the death of Alexander, this little republic was a prey to all the evils which flow from political discord. A zeal for the good of the community was now extinguished. Each town was only attentive to its private interest. There was no longer any stability in the state; for it changed its masters with every revolution in Macedonia. Towards the 124th Olympiad, about the time when Ptolemy Soter died, and when Pyrrhus invaded Italy, the republic of the Achæans recovered its old institutions and unanimity. The inhabitants of Patæ and of Dymæ were the first assertors of ancient liberty. The tyrants were banished, and the towns again made one commonwealth. A public council was then held, in which affairs of importance were discussed and determined. A register was

Acetabu-
lum
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Achæans.

Achæi
||
Achaia.

was appointed to record the transactions of the council. This assembly had two presidents, who were nominated alternately by the different towns. But instead of two presidents, they soon elected but one. Many neighbouring towns which admired the constitution of this republic, founded on equality, liberty, the love of justice, and of the public good, were incorporated with the Achæans, and admitted to the full enjoyment of their laws and privileges.—The arms which the Achæans chiefly used were slings. They were trained to the art from their infancy, by slinging from a great distance, at a circular mark of a moderate circumference. By long practice they took so nice an aim, that they were sure, not only to hit their enemies on the head, but on any part of the face they chose. Their slings were of a different kind from those of the Balearians, whom they far surpassed in dexterity.

ACHÆI (Achæans); the inhabitants of Achaia Propria. In Livy, the people of Greece; for the most part called *Achivi*, by the Roman poets. In Homer, the general name for Grecians. See ACHÆANS.

ACHÆORUM PORTUS (Pliny); now *Porto Buon*, a harbour of the Chersonesus Taurica, on the Euxine. Another, near Sigæum, into which the Xanthus, after being joined by the Simois, falls.

ACHÆMENES, according to Herodotus, was father of Cambyfes, and grandfather of Cyrus the first, king of Persia. Most of the commentators of Horace are of opinion, that the Achæmenes whom that poet mentions, ode xii. of his 2d book, was one of the Persian monarchs: but, if that were true, he must have reigned before the Medes subdued the Persians; for we do not hear of any king of that name from the time that the Persians founded that great monarchy, which is looked upon as the second universal one. However this be, the epithet *Achæmenians* is frequently given to the Persians in the old Latin poets.

ACHÆMENES, son of Darius I. king of Persia, and brother of Xerxes, had the government of Egypt bestowed on him, after Xerxes had forced the Egyptians to return to their allegiance. He some time after commanded the Egyptian fleet in the celebrated expedition which proved so fatal to all Greece. The Egyptians having again taken up arms after the death of Xerxes, Achæmenes was sent into Egypt to suppress the rebellion; but was vanquished by Inarus, chief of the rebels, succoured by the Athenians.

ACHÆUS, cousin-german to Seleucus Ceraunus and Antiochus the Great, kings of Syria, became a very powerful monarch, and enjoyed the dominions he had usurped for many years; but at last he was punished for his usurpations in a dreadful manner, in the 140th year of Rome, as related by Polybius*.

* Lib. viii. cap. 5, 6. ACHÆIA, a name taken for that part of Greece which Ptolemy calls *Hellas*; the younger Pliny, *Græcia*; now called *Livadia*: bounded on the north by Thessaly, the river Sperchius, the Sinus Maliacus, and mount Oeta; on the west by the river Achelous; on the east, turning a little to the north, it is washed by the Archipelago, down to the promontory of Sunium; on the south, joined to the Peloponnesus, or Morea, by the isthmus of Corinth, five miles broad.

ACHÆIA Propria, anciently a small district in the north of Peloponnesus, running westward along the bay of Corinth, and bounded on the west by the Ionian

Sea, on the south by Elis and Arcadia, and on the east by Sicyonia: inhabitants, the *Achæans*, properly so called; its metropolis, *Patra*. It is now called *Romania* Alta, in the Morea.

Achæia was also taken for all those countries that joined in the Achæan league, reduced by the Romans to a province. Likewise for Peloponnesus.

ACHÆIÆ Presbyteri, or the Presbyters of Achaia, were those who were present at the martyrdom of St Andrew the Apostle, A. D. 59; and are said to have written an epistle in relation to it. Bellarmine, and several other eminent writers in the church of Rome, allow it to be genuine; while Du Pin, and some others, expressly reject it.

ACHAÏUS, son of Ethwin, was raised to the crown of Scotland, A. D. 788. The emperor Charlemagne sent an embassy to desire an alliance with him against the English, whose pirates so infested the seas, that the merchants could not carry on their trade. This alliance was concluded in France upon conditions so advantageous to the Scots, that Achaius, to perpetuate the memory of it, added to the arms of Scotland a double field sowed with lilies. He died in 819.

ACHALALACTLI, in ornithology, a species of king's-fisher. See ALCEDO.

ACHAN, the son of Carmi, of the tribe of Judah, at the taking of Jericho concealed two hundred shekels of silver, a Babylonish garment, and a wedge of gold, contrary to the express command of God. This sin proved fatal to the Israelites, who were repulsed at the siege of Ai. In this dreadful exigence, Joshua prostrated himself before the Lord, and begged that he would have mercy upon his people. Achan was discovered by casting lots, and he and his children were stoned to death. This expiation being made, Ai was taken by stratagem. Josh. vii. 8, 9.

ACHANE, an ancient Persian corn measure, containing 45 Attic Midimni.

ACHARACA, anciently a town of Lydia, situate between Tralles and Nyfa; in which were the temple of Pluto, and the cave Charonium, where patients slept in order to obtain a cure.

ACHAT, in law, implies a purchase or bargain. And hence probably purveyors were called *Achators*, from their making bargains.

ACHATES, the companion of Eneas, and his most faithful friend, celebrated in Virgil.

ACHATES, in natural history. See AGATE.

ACHATES (anc. geog.), a river of Sicily, now the *Drillo*; which runs from north to south, almost parallel with, and at no great distance from, the Gela; and rises in the north of the territory of Noto. It gave name to the Achates, or Agate, said to be first found there.

ACHAZIB, or ACHZIB, (anc. geog.), a town of Galilee, in the tribe of Asher, nine miles from Ptolemais.—Also a town in the more southern parts of the tribe of Judah.

ACHEEN, ACHÉ, or ACHEN, a kingdom of Sumatra in the East Indies, situated on the north-western part of the island.

The capital is situated on a river which empties itself near the north-west point, or Acheen-head, about two miles from the mouth. It lies in a wide valley, formed

Achaia
||
Acheen.

Acheen. formed like an amphitheatre by two lofty ranges of hills. The river is not large, and by emptying itself in several channels is rendered very shallow at the bar. In the dry monsoon it will not admit boats of any burthen, much less large vessels, which lie without, in the road formed by the islands off the point. Though no longer the great mart of eastern commodities, it still carries on a considerable trade with the natives of that part of the coast of Indostan called *Telinga*, who supply it with the cotton goods of their country, and receive in return, gold-dust, sapan-wood, betel-nut, patch leaf (*col-fus Indicus*), a little pepper, sulphur, camphire, and benzoin. The country is supplied with Bengal opium, and also with iron, and many other articles of merchandize, by the European traders.

Acheen is esteemed, comparatively, healthy, being more free from woods and swamps than most other portions of the island; and the fevers and dysenteries to which these are supposed to give occasion, are there said to be uncommon. The soil is light and fertile; and the products, beside those already enumerated as articles of export trade, and a variety of fine fruits, are chiefly rice and cotton. There is likewise some raw silk procured in the country, of very inferior quality. Gold-dust is collected in the mountains near Acheen, but the greatest part is brought from the southern ports of Nalaboo and Soosoo. The sulphur is gathered from a volcano mountain in the neighbourhood, which supplies their own consumption for the manufacture of gun-powder, and admits of a large exportation.

In their persons, the Achenese differ from the rest of the Sumatrans; being taller, stouter, and darker complexioned. They appear not to be a genuine people; but are thought, with great appearance of reason, to be a mixture of Battas, Malays, and Moors from the west of India. In their dispositions they are more active and industrious than their neighbours; they possess more penetration and sagacity; have more general knowledge; and, as merchants, they deal upon a more extensive and liberal footing. Their religion is Mahometanism; and having a great number of mosques and priests, its forms and ceremonies are strictly observed.

The appearance of the town, and the nature of the buildings, are much the same as are found in the generality of Malay bazars, excepting that the superior wealth of this place has occasioned a great number of public edifices, but without the smallest pretensions to magnificence. The king's palace, if it deserves the appellation, is a very rude and uncouth piece of architecture, designed to resist the force of an enemy, and surrounded for that purpose by strong walls, but without any regular plan, or view to the modern system of military attack. The houses in common are built of bamboos and rough timber, and raised some feet from the ground on account of the place being overflowed in the rainy season.

A considerable fabric of a thick species of cotton cloth, and of stuff for the short drawers worn both by Malays and Achenese, is established here, and supplies an extensive demand. They weave also very handsome silk pieces, of a particular form, for that part of the dress which is called by the Malays *cayen sarrong*.

The Achenese are expert and bold navigators, and employ a variety of vessels, according to the

Acheen. voyages they undertake, and the purposes for which they design them. The river is covered with a multitude of fishing sampans or canoes, which go to sea with the morning breeze, and return in the afternoon, with the sea wind, full laden.

Having no convenient coins, though most species of money will be taken there at a valuation, they commonly make their payments in gold-dust, and for that purpose are all provided with scales or small steelyards. They carry their gold about them, wrapped up in pieces of bladder, and often purchase to so small an amount as to make use of grain or seeds for weights.

The monarchy is hereditary; and the king usually maintains a guard of 100 Seapoys about his palace.

According to Mr Marsden, "the grand council of the nation consists of, the King or *Sultan*, four *Ooloballangs*, and eight of a lower degree, who sit on his right hand, and sixteen *Cajoorangs*, who sit on his left. At the king's feet sits a woman, to whom he makes known his pleasure; by her it is communicated to an eunuch, who sits next to her, and by him to an officer named *Cajoorang Gondong*, who then proclaims it aloud to the assembly. There are also present two other officers, one of whom has the government of the *bazar* or market, and the other the superintending and carrying into execution the punishment of criminals. All matters relative to commerce and the customs of the port come under the jurisdiction of the *Shabandar*, who performs the ceremony of giving the *chap* or licence for trade; which is done by lifting a golden-hafted creese over the head of the merchant who arrives, and without which he dares not to land his goods. Presents, the value of which are become pretty regularly ascertained, are then sent to the king and his officers. If the stranger be in the style of an ambassador, the royal elephants are sent down to carry him and his letters to the monarch's presence; these being first delivered into the hands of an eunuch, who places them in a silver dish, covered with rich silk, on the back of the largest elephant, which is provided with a machine (*bouder*) for that purpose. Within about an hundred yards of an open hall where the king sits, the cavalcade stops, and the ambassador dismounts, and makes his obeisance by bending his body, and lifting his joined hands to his head. When he enters the palace, if an European, he is obliged to take off his shoes; and having made a second obeisance, is seated upon a carpet on the floor, where *betel* is brought to him. The throne was some years ago of ivory and tortoiseshell; and when the place was governed by queens, a curtain of gauze was hung before it, which did not obstruct the audience, but prevented any perfect view. The stranger, after some general discourse, is then conducted to a separate building, where he is entertained with the delicacies of the country, by the officers of state, and in the evening returns in the manner he came, surrounded by a prodigious number of lights. On high days (*aree ryah*) the king goes in great state mounted on an elephant richly caparisoned, to the great mosque, preceded by his *ooloballangs*; who are armed nearly in the European manner."

The country under the immediate jurisdiction of Acheen, is divided into three districts, named *Duo* *pooloo*

Achen, *pooloo duo*, *Duo pooloo leemo*, and *Duo pooloo anam*.
 Achelous. Each district is governed by a Pangleemo, and under him an Imaum and four Pangeeches to each mosque.

"Achen has ever been remarkable for the severity with which crimes are punished by their laws; the same rigour still subsists, and there is no commutation admitted, as is regularly established in the southern countries. There is great reason, however, to conclude, that the poor alone experience the rod of justice; the nobles being secure from retribution in the number of their dependants. Petty theft is punished by suspending the criminal from a tree, with a gun or heavy weight tied to his feet; or by cutting off a finger, a hand, or leg, according to the nature of the theft. Many of these mutilated and wretched objects are daily to be seen in the streets. Robbery on the highway and house-breaking are punished by drowning, and afterwards exposing the body on a stake for a few days. If the robbery is committed upon an imaum or priest, the sacrilege is expiated by burning the criminal alive. A man who is convicted of adultery is seldom attempted to be screened by his friends, but is delivered up to the friends and relations of the injured husband. These take him to some large plain, and forming themselves in a circle, place him in the middle. A large weapon called a *Gadoobong*, is then delivered to him by one of his family; and if he can force his way through those who surround him, and make his escape, he is not liable to further prosecution: but it commonly happens that he is instantly cut to pieces. In this case his relations bury him as they would a dead buffalo, refusing to admit the corpse into their house, or to perform any funeral rites." These discouragements to vice might seem to bespeak a moral and virtuous people: yet all travellers agree in representing the Achenese as one of the most dishonest and flagitious nations of the East.

Achen was visited by the Portuguese in 1509, only 12 years after they had discovered the passage to the East-Indies by the Cape of Good Hope. They made various attempts to establish themselves in the country, but were expelled with disgrace. See SUMATRA.

ACHELOUS, in fabulous history, wrestled with Hercules, for no less a prize than Deianira, daughter to king Oenus: but as Achelous had the power of assuming all shapes, the contest was long dubious: at last, as he took that of a bull, Hercules tore off one of his horns; so that he was forced to submit, and to redeem it by giving the conqueror the horn of Amalthea, the same with the Cornucopia or horn of plenty; which Hercules having filled with a variety of fruits, consecrated to Jupiter. Some explain this fable, by saying, That Achelous is a winding river of Greece, whose stream was so rapid, that it roared like a bull, and overflowed its banks; but Hercules, by bringing it into two channels, broke off one of the horns, and so restored plenty to the country. See the next article.

ACHELOUS, a river of Acarnania; which rises in mount Pindus, and, dividing Ætolia from Acarnania, falls from north to south into the Sinus Corinthiacus. It was formerly called *Thoas*, from its impetuosity, and *king of rivers*, (Homer.) The epithet *Achelous* is used for *Aqueus*, (Virgil); the ancients calling all water *Achelous*, especially in oaths, vows, and sacrifices, according to Ephorus: Now called *Aspro Potamo*. Rivers are by the ancient poets called *Tauriformes*, either from

VOL. I. Part I.

the bellowing of their waters, or from their ploughing the earth in their course: Hercules, restraining by dykes and mounds the inundations of the *Achelous*, is said to have broken off one of his horns, and to have brought back plenty to the country. See the preceding article.

ACHERI (LUKE D'), a learned Benedictine of the congregation of St Maur, was born at St Quintin, in Picardy, in 1609; and made himself famous by printing several works, which till then were only in manuscript: particularly, The epistle attributed to St Barnabas; the works of Lanfrank, archbishop of Canterbury; A collection of scarce and curious pieces, under the title of *Spicilegium*, i. e. Gleanings, in thirteen volumes quarto. The prefaces and notes, which he annexed to many of these pieces, show him to have been a man of genius and abilities. He had also some share in the pieces inserted in the first volumes of the acts of the saints of the order of St Bennet; the title whereof acquaints us that they were collected and published by him and father Mabillon. After a very retired life, till the age of 73, he died at Paris the 29th of April 1685, in the abbey of St Germain in the fields, where he had been librarian.

ACHERNER, or ACHARNER, a star of the first magnitude in the southern extremity of the constellation ERIDANUS, but invisible in our latitude.

ACHERON, a river of Epirus. The poets feigned it to have been the son of Ceres, whom she hid in hell for fear of the Titans, and turned into a river, over which souls departed were ferried in their way to Elysium.

ACHERON, a river of Thesprotia, in Epirus; which, after forming the lake Acherusia, at no great distance from, falls into the sea near, the promontory of Chimerium, to the west of the Sinus Ambracius, in a course from north to south.

ACHERON, or ACHEROS, a river of the Bruttii in Italy, running from east to west; where Alexander king of Epirus was slain by the Lucani, being deceived by the oracle of Dodona, which bid him beware of Acheron.

ACHERSET, an ancient measure of corn, conjectured to be the same to our quarter, or eight bushels.

ACHERUSIA PALUS, a lake between Cumæ and the promontory Misenum, no *il Lago Della Collucia*, (Cluverius.) Some confound it with the *Lacus Lucrinus*, and others with the *Lacus Avernus*. But Strabo and Pliny distinguish them. The former takes it to be an effusion, exundation, or washes of the sea, and therefore called by Lycophron, *Αχρησια χυσις*.—Also a lake of Epirus, through which the Acheron runs.—There is also an *Acherusia*, a peninsula of Bithynia on the Euxine, near Heraclea; and a cave there of the same name, through which Hercules is fabled to have descended to hell to drag forth Cerberus.

ACHIAR, is a Malayan word, which signifies all sorts of fruits and roots pickled with vinegar and spice. The Dutch import from Batavia all sorts of achiar, but particularly that of BAMBOO (See ARUNDO), a kind of cane, extremely thick, which grows in the East Indies. It is preserved there whilst it is still green, with very strong vinegar and spice; and is called *bamboo-achiar*. The name changes according to the fruit with which the achiar is made.

ACHICOLUM, is used to express the *fornix*, the-

I

lus

Acheri
||
Achicolum.

Achillæa lus, or sudatorium of the ancient baths: which was a hot room where they used to sweat. It is also called *architholus*.

ACHILLÆA, YARROW, MILFOIL, NOSEBLEED, or SNEEZEWORD; a genus of the order of the polygamia superflua, belonging to the syngenesia class of plants. The natural order to which it belongs is the 49th *Compositæ discoides*.

The characters are: The common *calyx* is ovate and imbricated, with ovate, acute, converging scales. The *compound corolla* is rayed; the hermaphrodite corolllets are tubular in the disc, the feminine linguiform and from 5 to 10 in the rays: The *proper corolla* of the hermaphrodites is funnel-shaped, expanded, and divided into 5 segments; that of the females, tongue-shaped, inversely cordated, expanding, and of 3 segments. The *stamina* in the hermaphrodites consist of 5 very short capillary filaments; the antheræ is cylindric and tubular. The *pistillum* in the hermaphrodites has a small germen; the stylus is filiform the length of the stamina; the stigma is obtuse and end-notched: in the females, the germen is small; the stylus is filiform; the stigmata are 2, obtuse and reflected. The *pericarpium* is wanting; the calyx scarcely changed; the receptacle filiform, elongated at the disc of the seeds, ovate, and twice as long as the calyx. The *seeds* are solitary, ovate, and furnished with a lock of wool; no pappus. The *receptaculum* is chaffy and elevated.

Species and properties. There are 20 species, of which the following are the principal: 1. The milfolium, or common yarrow, is found naturally on banks, and by the sides of foot-paths, in most parts of England. It most commonly bears white flowers, though a variety of it is found which bears purple ones. These, however, do not long continue to bear flowers of this colour, if transplanted into gardens. It was formerly used in medicine; but though it may still have a place in some dispensatories, no physician of any note expects any virtue from it, or ever prescribes it. It creeps greatly by its roots, and also multiplies by the seeds, so that it becomes a troublesome weed where it is once allowed to get a footing. The cultivation of it is recommended by Mr Anderson, in his *Essays on Agriculture*, as a proper food for cattle. This species was the proper achillæa of the ancients, so named from Achilles; who, having been the disciple of Chiron, first brought it into use for the cure of wounds and ulcers. 2. The fantolina, or eastern sneezewort, is sometimes cultivated in gardens; it has large yellow flowers, which stand upon pretty long footstalks placed singly, not in bunches as in the common kind. It has leaves like lavender-cotton, which, when rubbed, emit a strong oily odour. The flowers appear in June and July. 3. The tomentosa, or woolly yarrow, is a native of the south of France and Spain, but lives in the open air in England. The flowers are of a bright yellow, and continue long in beauty, growing in clusters at the top of the stalks, which seldom rise above a foot high. The leaves are finely cut, and very hoary. 4. The abrotanifolia, or tall eastern yarrow, is a native of the islands in the Archipelago: it grows to the height of two feet and a half, with large umbels of yellow flowers on the top; the leaves resemble those of the common wormwood, and are cut into long narrow segments. 5. The cla-

venna, or Alpine umbelliferous wormwood, takes its name from the mountains of which it is a native. It seldom grows above six or seven inches in height; it supports umbels of white flowers, like those of the common sneezewort, which appear in April and May. The leaves are silvery, and shaped like those of wormwood, which often decay in the autumn and winter. 6. The tanacetifolia, or eastern sneezewort, with tansey leaves, is a very humble plant, seldom rising above six inches in height. The flowers are nearly as large as those of the common sneezewort, white, and growing in flat umbels. They appear in June and July. The leaves of the plant have some likeness to those of the common wormwood, are very hoary, grow close to the ground, and decay in autumn so as to make little appearance in winter. Like the last species, this is a native of the Alps. 7. The ageratum, or sweet maudlin, was formerly much used in medicine and for culinary purposes, but has now fallen so much into neglect as to be totally unknown in the markets; so that when it is demanded, the white maudlin is substituted in its stead. The reason of this substitution was, that the latter is more hardy and easily propagated than the sweet maudlin, which is apt to rot in wet winters. The common maudlin flowers in June and July, and the seeds are ripe in September. 8. The Egyptiaca, or hoary sneezewort, is a native of the Archipelago. It hath very hoary leaves, which remain all the year; and the plants growing close and low, make a pretty appearance at all seasons. The flowers are yellow, and are produced in umbels on the top of the stalks; they appear in June, and continue till the end of September. 9. The ptarmica, or common sneezewort, grows wild in the woods, and other shady places, in many parts of England; so is not admitted into gardens. There is a variety, however, with double flowers, which is preserved in gardens, and is commonly known by the name of *double maudlin*. This species creeps greatly by the roots, so as soon to overspread a large spot of ground. If planted in pots, so as to confine its roots from creeping, the stalks grow close together, and make a tolerable appearance when in flower; but when at a distance so that the roots have full liberty to run, the flowers appear but indifferently. 10. The macrophylla, or Alpine sneezewort, with feverfew leaves, is a native of the Alps. It produces many stalks rising near three feet high; having loose branching umbels of white flowers on their top, resembling those of the common sneezewort, but larger. 11. The nana, or hoary Alpine milfoil, is likewise a native of the Alps; the leaves are hoary, and the umbels of its flowers are more compact than the former; the stalks do not rise more than a foot high. 12. The nobilis, or sweet milfoil, approaches to the nature of the common milfoil; but its leaves are of a paler green, and are neither so long nor so much cut off as those of the common milfoil are: they have a strong sweet scent when bruised. 13. The alpina, or white maudlin, bears some resemblance to the common sneezewort; but the leaves are longer, of a deeper green colour, and deeply indented in their edges; the flowers are white, and the roots creep far under ground. The plant will rise, in good land, to the height of four feet.

Culture. All the sorts of yarrow are easily propagated by seeds, which may be sown either in the spring or

Achilleid, or autumn, upon a bed of common earth. When the plants come up, and are strong enough for transplanting, they should be planted in beds in the nursery, where they may continue till autumn, when they should be transplanted to the places where they are to remain. The Archipelago kinds, however, are often destroyed by severe frost; so they ought to be sheltered during the winter. These kinds also rarely bring their seeds to perfection in England; they are therefore to be propagated by slips, which may be taken off and planted in a shady border any time in summer, when they will take root in about six weeks, and then may be transplanted where they are to remain.

ACHILLEID, **ACHILLEIS**, a celebrated poem of Statius, in which that author proposed to deliver the whole life and exploits of Achilles; but being prevented by death, he has only treated of the infancy and education of his hero. See **STATIUS**.

ACHILLES, one of the greatest heroes of ancient Greece, was the son of Peleus and Thetis. He was a native of Phthia, in Thessaly. His mother, it is said, in order to consume every mortal part of his body, used to lay him every night under live coals, anointing him with ambrosia, which preserved every part from burning but one of his lips, owing to his having licked it. She dipped him also in the waters of the river Styx; by which his whole body became invulnerable, except that part of his heel by which she held him. But this opinion is not universal, nor is it a part of his character as drawn by Homer; for in the Iliad (B. xxi. 161.) he is actually wounded in the right arm, by the lance of Asteropaeus, in the battle near the river Scamander. Thetis afterwards intrusted him to the care of the centaur Chiron, who, to give him the strength necessary for martial toil, fed him with honey and the marrow of lions and wild boars. To prevent his going to the siege of Troy, she disguised him in female apparel, and hid him among the maidens at the court of king Lycomedes: but Ulysses discovering him, persuaded him to follow the Greeks. Achilles distinguished himself by a number of heroic actions at the siege. Being disgusted, however, with Agamemnon for the loss of Briseis, he retired from the camp. But returning to avenge the death of his friend Patroclus, he slew Hector, fastened his corps to his chariot, and dragged it round the walls of Troy. At last Paris, the brother of Hector, wounded him in the heel with an arrow, while he was in the temple treating about his marriage with Philoxena, daughter to king Priam. Of this wound he died, and was interred on the promontory of Sigæum; and after Troy was taken, the Greeks sacrificed Philoxena on his tomb, in obedience to his desire, that he might enjoy her company in the Elysian fields. It is said, that Alexander, seeing this tomb, honoured it by placing a crown upon it; at the same time crying out, that "Achilles was happy in having, during his life, such a friend as Patroclus; and, after his death, a poet like Homer." Achilles is supposed to have died 1183 years before the Christian æra.

ACHILLES TATIUS. See **TATIUS**.

Tendo Achillis, in anatomy, is a strong tendinous cord formed by the tendons of several muscles, and inserted into the os calcis. It has its name from the fatal wound Achilles is said to have received in that part from Paris the son of Priam.

ACHILLINI (Alexander), born at Bologna, and doctor of philosophy in that university. He flourished in the 15th and 16th centuries, and by way of eminence was styled the Great Philosopher. He was a steadfast follower and accurate interpreter of Averroes upon Aristotle, but most admired for his acuteness and strength of arguing in private and public disputations. He made a surprising quick progress in his studies, and was very early promoted to a professorship in the university; in which he acquitted himself with so much applause that his name became famous throughout all Italy. He continued at Bologna till the year 1506; when the university of Padua made choice of him to succeed Antonio Francatiano in the first chair of philosophy, and his fame brought vast numbers of students to his lectures at Padua: but the war, wherein the republic of Venice was engaged against the league of Cambray, putting a stop to the lectures of that university, he withdrew to his native country; where he was received with the same marks of honour and distinction as before, and again appointed professor of philosophy in Bologna. He spent the remainder of his life in this city, where he died, and was interred with great pomp in the church of St Martin the Great, which belongs to the Carmelite friars. Jovius, who knew Achillini, and heard his lectures, says, that he was a man of such exceeding simplicity, and so unacquainted with address and flattery, that he was a laughing-stock to the pert and saucy young scholars, although esteemed on account of his learning. He wrote several pieces on philosophical subjects, which he published, and dedicated to John Bentivogli.

ACHILLINI (Claudius), grandson of the former, read lectures at Bologna, Ferrara, and Parma: where he was reputed a great philosopher, a learned divine, an excellent lawyer, an eloquent orator, a good mathematician, and an elegant poet. He accompanied Cardinal Ludovino, who went as legate into Piedmont; but being afterward neglected by this cardinal, when he became pope under the name of Gregory XV. he left Rome in disgust, and retired to Parma; where the duke appointed him professor of law, with a good salary. He published a volume of Latin Letters, and another of Italian poems, which gained him great reputation: he died in 1640, aged 66.

ACHIOTTE, or **ACHIOU**, a foreign drug, used in dyeing, and in the preparation of chocolate. It is the same with the substance more usually known by the name of **ARNOTTO**; which see.

ACHIROPCELOS, a name given by ancient writers to certain miraculous pictures of Christ and the Virgin, supposed to have been made without hands.—The most celebrated of these is the picture of Christ, preserved in the church of St John Lateran at Rome; said to have been begun by St Luke, but finished by the ministry of angels.

ACHMET, son of Seerim, has left a book concerning the interpretation of dreams according to the doctrine of the Indians, Persians, and Egyptians, which was translated out of Greek into Latin by Leo Tuscus in 1160. He lived in the 9th century.

ACHMET GEDUC, a famous general under Mahomet II. and Bajazet II. in the 15th century. When Mahomet II. died, Bajazet and Zezan both claimed the throne: Achmet sided with the former, and by his

Achmet-
schet,
Achmim.

bravery and conduct fixed the crown on his head. But Bajazet took away his life; shining virtue being always an unpardonable crime in the eyes of a tyrant.

ACHMETSCHET, a town of the peninsula of the Crimea, the residence of the sultan Galga, who is eldest son of the Khan of Tartary. Long. 51. 20. Lat. 45. 0.

ACHMIM, a large town of Upper Egypt, situated on the eastern bank of the Nile. "One admires there (says Abulfeda, as quoted by Mr Savary) a temple, which is comparable to the most celebrated monuments of antiquity. It is constructed with stones of a surprising size, on which are sculptured innumerable figures." Though this town be fallen from its ancient splendor, it is still one of the most beautiful of Upper Egypt. According to Mr Savary, an Arab prince commands there, and the police is well attended to. The streets are wide and clean, and commerce and agriculture flourish. It has a manufactory of cotton, stuffs, and pottery, which are conveyed over all Egypt. It is the same that Herodotus calls *Chemmis*, and Strabo *Panopolis*, or the city of Pan, who was worshipped there. Herodotus says, that Perseus was a native of this city, and that his descendants had established festivals there in his honour. It has lost its ancient edifices, and much of its extent; the ruins of the temple, described by Abulfeda, being without its limits, to the north. Nothing remains of it but some stones, of such magnitude that the Turks have not been able to move them. They are covered with hieroglyphics. On one of them are traced four concentric circles, in a square. The innermost of these contains a sun. The two succeeding ones, divided into 12 parts, contain, one, 12 birds, the other, 12 animals almost effaced, which appear to be the signs of the zodiac. The fourth has no divisions, and presents 12 human figures; which Mr Savary imagines to represent the 12 gods, the 12 months of the year, and the 12 signs of the zodiac. The Egyptians, says Herodotus, are the first who divided the year into 12 months, and employed the names of the 12 gods. The four seasons occupy the angles of the square, on the side of which may be distinguished a globe with wings. Mr Savary thinks it probable that this stone belonged to a temple dedicated to the sun, that the whole of these hieroglyphics mark his passage into the signs of the zodiac, and his course, whose revolution forms the year. The columns of this temple have been partly broken to make lime and millstones. Some of them have been transported into one of the mosques of Achmim, where they are placed without taste; others are heaped up in the squares of the town.

Mr Savary tells us of a serpent which is worshipped here, and is the wonder of the country. "Upwards of a century ago (says he), a religious Turk called *Scheilk Haridi* died here. He passed for a saint among the Mahometans; who raised a monument to him, covered with a cupola, at the foot of the mountain. The people flocked from all parts to offer up their prayers to him. One of their priests, profiting by their credulity, persuaded them that God had made the soul of *Scheilk Haridi* pass into the body of a serpent. Many of these are found in the Thebais, which are harmless; and he had taught one to obey his voice. He appeared with his serpent, dazzled the vulgar by his surprising tricks,

and pretended to cure all disorders. Some lucky instances of success, due to nature alone, and sometimes to the imagination of the patients, gave him great celebrity. He soon confined his serpent *Haridi* to the tomb, producing him only to oblige princes and persons capable of giving him a handsome recompence. The successors of this priest, brought up in the same principles, found no difficulty in giving sanction to so advantageous an error. They added to the general persuasion of his virtue that of his immortality. They had the boldness even to make a public proof of it. The serpent was cut in pieces in presence of the Emir, and placed for two hours under a vase. At the instant of lifting up the vase, the priests, no doubt, had the address to substitute one exactly resembling it. A miracle was proclaimed, and the immortal *Haridi* acquired a fresh degree of consideration. This knavery procures them great advantages. The people flock from all quarters to pray at this tomb; and if the serpent crawls out from under the stone, and approaches the suppliant, it is a sign that his malady will be cured. It may be imagined, that he does not appear till an offering has been made proportioned to the quality and richness of the different persons. In extraordinary cases, where the sick person cannot be cured without the presence of the serpent, a pure virgin must come to solicit him. To avoid inconveniences on this head, they take care to choose a very young girl indeed. She is decked out in her best clothes, and crowned with flowers. She puts herself in a praying attitude; and as the priests are inclined, the serpent comes out, makes circles round the young suppliant, and goes and reposes on her. The virgin, accompanied by a vast multitude, carries him in triumph amidst the general acclamation. No human reasoning would persuade these ignorant and credulous Egyptians that they are the dupes of a few impostors: they believe in the serpent *Haridi* as firmly as in the prophet."

ACHONRY, a small town of Ireland, in the province of Connaught and county of Sligo, seated on the river Shannon.

ACHOR, a valley of Jericho, lying along the river Jordan, not far from Gilgal; so called from Achan, the troubler of Israel, being there stoned to death.

ACHOR, in medicine, a species of HERPES.

ACHOR, in mythology, the god of flies; to whom, according to Pliny, the inhabitants of Cyrene sacrificed, in order to obtain deliverance from the insects and the disorders occasioned by them.

ACHRADINA (anc. geog.), one of the four cities or divisions of Syracuse, and the strongest, largest, and most beautiful part of it; separated by a very strong wall from the outer town, *Tycha* and *Neapolis*. It was adorned with a very large forum, with beautiful porticos, a most elegant prytaneum, a spacious senate-house, and a superb temple of Jupiter Olympius.

ACHRAS, or SAPOTA PLUM: a genus of the monogynia order, belonging to the hexandria class of plants; and ranking in the 43d Natural Order, *Dumoseæ*.

The characters are: The calyx is a perianthium, consisting of six ovate concave erect leaflets, the exterior ones broader and shorter, the interior ones coloured. The corolla is composed of one ovate petal, the height of the calyx; the border divided into six segments.

Achmim
||
Achras.

Achras segments. The *stamina* have six short subulated filaments at the throat of the corolla; and the antheræ are acute. The *pistillum* has a roundish depressed germen; the stylus is subulated, and longer than the corolla; the stigma is obtuse. The *pericarpium* is a globular twelve-celled pomum, with very soft flesh. The seeds are solitary, ovate, and glossy.

There are four species, all natives of the West Indies. The principal are, 1. The sapota, with oblong oval leaves, and smooth turbinate fruit. 2. The mammosa, with spear-shaped leaves, and large oval fruit. The first is common about Panama, and some places in the Spanish West Indies; but is not to be found in any of the British settlements in America. The second sort is very common in Jamaica, Barbadoes, and most of the West India islands, where the trees are planted in the gardens for their fruit, which is by many persons greatly esteemed. They grow to the height of 35 or 40 feet, having a straight trunk covered with an ash-coloured bark. The branches are produced on every side, forming a regular head; and are beset with leaves near a foot long, and almost three inches broad in the middle. The flowers are of a cream colour: and are succeeded by large oval fruit covered by a brownish skin, inclosing a thick pulp of a russet colour, very luscious, and called *natural marmalade*, from its resemblance to that of quinces. The stones taken in emulsion are reckoned good against the gravel.—These trees being natives of very hot climates, cannot be preserved in this country except in the warmest stoves.

ACHROMATIC, an epithet expressing want of colour. The word is Greek, being compounded of *α*, privative, and *χρῶμα*, colour.

ACHROMATIC Telescopes, are telescopes contrived to remedy the aberrations in colours; see **ABERRATION**.—A particular account of the invention and construction of these instruments will be found under **OPTICS**.

ACHTELING, a measure for liquids used in Germany. Thirty-two *achtelings* make a *beemer*; four *sciltims* or *sciltins*, make an *achteling*.

ACHYR, a strong town and castle of the Ukrain, subject to the Russians since 1667. It stands on the river Uorsklo near the frontiers of Russia, 127 miles W. of Kiow, Long. 36.0. Lat. 49.32.

ACHYRANTHES, in botany, a genus of the pentandria order, belonging to the monogynia class of plants, and associating with the *Miscellaneæ*, in the 54th Natural Order.

The characters are: The *calyx* is a double perianthium; the exterior one consisting of three lanceolate acute leaves, which are persistent; the interior of five leaves, also persistent. No *corolla*: The nectarium is five-valved, surrounding the germen, bearded at the top, concave, and falling off. The *stamina* consist of five filaments the length of the corolla; the antheræ are ovate and incumbent. The *pistillum* has a top-shaped germen; the stylus is filiform, and the length of the stamina; the stigma is villous, and divided into two segments. The *perianthium* is a roundish one-celled capsule, not gaping. The *seed* is single and oblong.

Of this genus eight species are enumerated; but the character of the genus does not agree in them all.

The species are all natives of the Indies. Only one of them, the *amaranthus*, is commonly cultivated in

botanical gardens, and that more for the sake of variety than beauty. It grows to the height of three feet, with oblong pointed leaves. The flowers come out in long spikes from the extremities of the branches, and appear in July, the seeds ripening in September. Plants of this kind must be reared in a hot-bed, and may be transplanted when they have acquired sufficient strength. If kept in pots, and sheltered during the winter in a warm green-house, they will live two or three years.

ACICANTHERA, in botany, the trivial name of a species of *RHEXIA*.

ACICULÆ, the small pikes or prickles of the hedge-hog, *echinus-marinus*, &c.

ACIDALIUS (Valens) would, in all probability, have been one of the greatest critics in these latter ages, had he lived longer to perfect those talents which nature had given him. He was born at Wittstock, in Brandenburg; and having visited several academies in Germany, Italy, and other countries, where he was greatly esteemed, he afterwards took up his residence at Breslaw, the metropolis of Silesia. Here he remained a considerable time, in expectation of some employment; but nothing offering, he returned Roman-catholic, and was chosen rector of a school at Nieffa. It is related, that about four months after, as he was following a procession of the host, he was seized with a sudden phrenzy; and being carried home, expired in a very short time. But Thuanus tells us, that his excessive application to study was the occasion of his untimely death; and that his sitting up a-nights in composing his Conjectures on Plautus, brought upon him a distemper which carried him off in three days, on the 25th of May 1595, being just turned of 28. He wrote a Commentary on Quintus Curtius; also, Notes on Tacitus, on the Twelve Panegyrics; besides speeches, letters, and poems. His poetical pieces are inserted in the *Deliciæ* of the German poets, and consist of epic verses, odes, and epigrams. A little piece, printed in 1595, under the title of *Mulieres non esse homines*, "That women were not of the human species," was falsely ascribed to him. But the fact was, that Acidalius happening to meet with the manuscript, and thinking it very whimsical, transcribed it, and gave it to the bookseller, who printed it. The performance was highly exclaimed against, inasmuch that the bookseller being seized, he discovered the person who gave him the manuscript, and a terrible outcry was made against Acidalius. A story goes, that being one day to dine at a friend's house, there happened to be several ladies at table; who supposing him to be the author, were moved with so much indignation, that they threatened to throw their plates at his head. Acidalius, however, ingeniously diverted their wrath. In his opinion, he said, the author was a judicious person, the ladies being certainly more of the species of *angels* than of *men*.—Mr. Baillet has given him a place among his *Enfans Celebres*; and says, that he wrote a comment upon Plautus when he was but 17 or 18 years old, and that he composed several Latin poems at the same age.

ACIDALUS, a fountain in Orchomenus, a city of Boeotia, in which the Graces, who are sacred to Venus, bathed. Hence the epithet *Acidalia*, given to Venus, (Virgil.)

ACIDITY, that quality which renders bodies acid.

ACI-

Acican-
thera,
||
Acidity.

Acidoton,
acids.

I
General
properties
of acids.

2
Of the na-
ture of acids.

ACIDOTON, in botany, the trivial name of a species of *ADELIA*.

ACIDS, in chemistry, the name by which one of the general classes of salts are distinguished. The characteristic marks of them are, 1. The peculiar taste which we call sour; though this does not hold universally: for the acid of arsenic, which in other respects manifests a strong acid power, has not this sour taste; nor are the volatile sulphureous acid, or those of *tungsten* and *molybdæna*, lately discovered by Mr Scheele, very distinguishable in this way. On the other hand, the strong acids of vitriol, nitre, and even sea-salt, are altogether caustic, and cannot be tasted until they have been largely diluted with water. 2. With water they combine into a fluid, the specific gravity of which is not a medium betwixt the water and acid separately taken. This holds good with the strong acids, which grow hot with water, and shrink into less bulk by reason of their emitting a quantity of the fire they contain: but whether it also takes place in the weaker acids, has not yet been ascertained; though the probability is, that it will take place in them also. 3. With spirit of wine, they unite into a very volatile and inflammable substance called *ether*. This also must be understood only of the strong mineral acids, or of the acetous when very much concentrated; for the acids of tartar, borax, arsenic, lapis ponderosus (*tungsten*), and *molybdæna*, do not produce any. 4. They change the blue colour of vegetables to red, and heighten the colour of those which are already red.—This property is more universal than those we have yet mentioned; but the volatile sulphureous acid, those of *tungsten* and *molybdæna*, are exceptions. 5. They unite with all kinds of earths excepting the siliceous (though the fluor acid dissolves this also), with fixed and volatiles alkalis, and with metals, in such a manner as to form compounds considerably permanent, and whose ingredients cannot be separated without some difficulty. This is the most universal and distinguishing mark; and there is not any acid but what shows its attraction for one or other of these substances, especially the alkaline salts. Oils, and fats, indeed, will unite with alkalis; but they may be separated by the weakest known acids, so that there is no danger of confounding the two together. 6. When mixed with any fermentable liquor, they prevent that process from taking place; or, if it has already begun, they will put a stop to it. This also must be understood only of the stronger acids, or at least will require a considerable quantity of the weaker to effect it. 7. They cannot be frozen but in a degree of cold below the freezing point of water. This property is likewise not universal, but is remarkable only in the stronger acids.

The nature of acids has long been a matter of speculation, and of late has engaged the attention of philosophers very considerably. Some have supposed them to be simple chemical elements, while others imagined them to be composed of water and earth. Both these opinions, however, are inadmissible; the former, because we are certain that most acids may be entirely decomposed, and resolved into aerial vapours of different kinds, which could not happen if they were simple and unchangeable elements; the latter, because there is not the smallest probability that two ingredients, seemingly so insipid and inactive as water and earth, could by their union produce a compound endowed

with such powerful and even destructive properties as many of the acids possess.—The late discoveries concerning air of different kinds have suggested a new theory, first published by M. Lavoisier, and strenuously maintained by the French chemists, viz. That the acid principle is contained in the air; and, according as it combines itself with different substances, forms acids of different denominations.

This theory he considers as established by numerous indisputable experiments. These cannot here be detailed; but his conclusions from the whole are, That “*dephlogisticated air* enters as a constituent part into the composition of several acids, particularly the phosphoric, vitriolic, and nitrous; that this pure and highly respirable air is the constitutive principle of acidity common to all acids; and that the difference by which they are distinguished from each other is produced by the union of one or more principles besides this air, so as to constitute the particular form under which each acid appears.” To dephlogisticated air in its state of fixity, therefore, he gives the title of the *acidifying* or *oxygenous* principle; and concludes farther from his experiments, 1. “That, when combined with the matter of fire, heat, and light, this principle produces dephlogisticated air; though he considers this position as not capable of absolute demonstration. It must not, therefore, be confounded with the following; which, he says, are supported by experiment and positive proofs. 2. That the same acidifying principle, combined with phlogistic substances or charcoal, forms fixed air. 3. That with sulphur it forms vitriolic acid. 4. That with nitrous air it forms nitrous acid. 5. That with Kunckel’s phosphorus it forms the phosphoric acid. 6. With sugar it forms the acid of sugar, &c.

The opinion of Mr Lavoisier concerning the composition of acids has in part been adopted by Mr Kirwan; who, in his treatise on Phlogiston, published in 1787, informs us, that he is now of opinion “that dephlogisticated air becomes an essential constituent part of acids. All acids (he adds) consist of two principles: one peculiar to each, which, in the opinion of the antiphlogistians, has not as yet been decomposed, and consequently must be looked upon, relatively to the present state of our knowledge, as a simple substance: the other, *pure air*, in a concrete state; that is, deprived of the greater part of its specific heat, and condensed into a smaller volume. The first they call the *acid basis*; the last, the *oxygenous principle*: thus the vitriolic acid, according to them, consists of sulphur as its basis, and pure air in a concrete state as its acidifying or oxygenous principle. This doctrine of the composition of acids has been admitted by some of the ablest defenders of phlogiston, and particularly by that distinguished philosophic chemist M. de Morveau, with this single modification, that the bases of acids contain phlogiston, which they lose on uniting to pure air: yet it seems very difficult to conceive how pure air can unite to phlogiston, a substance to which it has the greatest affinity, without forming a new compound endowed with very different properties from those which it possessed before such union. It seems therefore more reasonable to conclude, either that it forms water, as Mr Cavendish thinks; or fixed air, as I shall afterwards endeavour to prove.”

In his explanation of the formation of acids, Mr Kirwan

Acids.

3
Mr Lavoisier's hypothesis that air is the acid principle.

4
Basis of dephlogisticated air supposed to be the acid principle.

5
Mr Kirwan's opinions.

Acids.

Kirwan first states the opinion of the antiphlogistians, viz. That the vitriolic acid, when considered abstractedly from the water it contains, always consists of sulphur (which they consider as a simple substance) united to a large portion of the oxygenous principle. "In my opinion (says he), it consists of a basis or radical principle, which, when saturated with phlogiston, constitutes sulphur; when saturated with fixed air, becomes common fixed vitriolic acid; and, when combined partly with the one and partly with the other, becomes volatile vitriolic acid. That sulphur, during its conversion into vitriolic acid, unites to air of some sort or other, is evident from the quantity of air which it absorbs, in whatever way that conversion is brought about. Thus, first, during combustion in respirable air, 100 grains of sulphur absorb 420 cubic inches of pure air, or about 143 grains: but the proportion of this pure air united with a given quantity of sulphur is not easily determined, because it is vitriolic air that is constantly formed; and this air essentially contains some portion of sulphur in solution, which portion is variable. Secondly, Pyrites, during their decomposition, absorb a considerable proportion of pure air; as Mr Lavoisier has observed; so also does liver of sulphur exposed to the atmosphere, for after some time it is converted into tartar vitriolate."

6 Whether pure air absorbed during the combustion of sulphur continues to be pure air; or whether it be converted into water or fixed air? He inclines to the latter opinions, for various reasons* which he specifies.

With regard to the nitrous acid, the experiments of Mr Cavendish, as well as of the French chemists, leave no room to doubt that it is produced during the dephlogistication of dephlogisticated and inflammable air. Mr Cavendish has shown, that the nitrous acid may be formed by taking the electric spark in a mixture of three measures of phlogisticated air and seven of dephlogisticated air, or, in weight, one part of the former and about 2.6 of the latter. Mr Lavoisier, as has been already mentioned, supposes the nitrous acid to be composed of nitrous air united to the oxygenous principle, or basis of pure air; and 100 grains of dry nitrous acid consist of 64 grains of nitrous air united to 36 of pure air deprived of its specific fire; or, according to Mr Kirwan's calculation, 173 cubic inches of nitrous air and 105 of pure air. But nitrous air, as Mr Lavoisier himself has observed, is a compound; 100 grains of it, according to him, containing 32 of phlogisticated and 68 of pure air; consequently 64 grains of it contain 20.5 of phlogisticated air, and 43.5 of pure air. Hence, according to him, 100 grains of dry nitrous acid contain $79\frac{1}{2}$ of pure air and $20\frac{1}{2}$ of phlogisticated air. Mr Kirwan is of opinion, that 100 grains of pure, dry, and colourless nitrous acid contain 38.17 grains of fixed air as its acidifying principle, 57.06 of nitrous basis, and 4.77 of phlogiston united to the nitrous basis. With regard to the nitrous basis itself, he says that one third of its weight is phlogisticated and two thirds dephlogisticated air, both in a concrete state.

"Nitrous basis (says Mr Kirwan), saturated with phlogiston, constitutes nitrous air: 100 grains of this basis take up nearly 22 of phlogiston. Hence the constituent principles of nitrous acid are fixed air, dephlo-

gisticated air, phlogisticated air, and inflammable air, all in their concrete state.

"Red, yellow, green, and blue nitrous acids, when those colours are intense, owe their origin to the absorption of nitrous air; and consequently the proportion of their principles is variable, though all have the dephlogisticated acid for their ground. Thus Dr Priestley, having exposed strong pale-yellow nitrous acid, whose specific gravity could not be less than 1.400 to nitrous air, found that 100 grains of this acid absorbed, in two days, 247 cubic inches of nitrous air: now, 100 grains of this spirit must have contained, by my calculation, about 21 grains of dry acid, and these 21 grains took up 91.39 grains of nitrous air. When about 20 cubic inches of nitrous air were absorbed (that is, about seven grains), the acid became of an orange colour; when 50 cubic inches were absorbed (about 18 grains), it became green; and when nearly the whole was absorbed, it evaporated in the form of nitrous vapour, carrying off part of the water with it. Hence we see, that nitrous vapour consists of nitrous acid united to three or four times its weight of nitrous air and a little water."

Mr Kirwan next proceeds to contest Mr Lavoisier's⁹ opinion, that nitrous air is a constituent principle of the nitrous acid. "The following experiments (says he) show that nitrous air is not a constituent principle of the nitrous acid, but that fixed air is. 1. There is not a doubt but that pure nitrous acid enters entire, and without decomposition, into fixed alkalis, and forms nitre. Now if nitre be distilled in a good earthen retort, it will be wholly decomposed; and so also will the acid itself, except a few drops which pass in the beginning of the distillation, and nothing but dephlogisticated air, more or less pure, and consequently intermixed with phlogisticated air and a slight proportion of fixed air, will be found: these, therefore, are its true constituent parts when disengaged from substances that cannot communicate phlogiston to it in any remarkable quantity, such as alkalis and earths; but if it be separated from substances that contain phlogiston, such as metals, it will then indeed be resolved into nitrous air, and dephlogisticated air more or less pure, the phlogiston of the fixed air being detained by the metal. Mr Berthollet, who seems to have made the experiment with the greatest exactness, produced 714 cubic inches of dephlogisticated air from a Troy ounce of nitre. This, however, was far from being of the purest kind; and Dr Priestley, Mr Berthollet, and Mr Succow, observed, that the air which first passes contains fixed air, and renders lime-water turbid. Here then we have three of the constituent parts of the nitrous acid, with scarce any nitrous air; which the antiphlogistians suppose to be one of the constituent parts of the acid, and to make two-thirds of its bulk when exhibited in an aerial form."

To obviate an objection that the quantity of fixed air thus obtained is too small to deserve to be ranked among the constituent parts of the nitrous acid, Mr Kirwan first inquires in what proportion it ought to exist there; and though this is variable, according to the different states of the nitrous acid with respect to phlogistication, he reckons it at one-third of the acid as existing in the nitre; and from the decomposition of this

Acids.

Acids.
Mr Lavoisier's hypothesis is that air is the acid principle.

4
Basis of dephlogisticated air supposed to be the acid principle.

6
Whether pure air absorbed during the combustion of sulphur continues to be pure air; or whether it be converted into water or fixed air? He inclines to the latter opinions, for various reasons* which he specifies.

* Essay, P. 29.
7
Formation of the nitrous acid.

8
Proportion of its constituent parts.

9
Mr Lavoisier's theory contested.

Acids.

this fixed air, and the phlogiston emitted by it of consequence, he attributes the phlogistication and redness of the nitrous acid when exposed to more heat. As a proof that fixed air may be decomposed in this manner, he adduces two experiments of Dr Priestley. In one of these, dephlogisticated air was obtained by means of acetous acid in that concentrated state in which it is called *radical vinegar*. Having mixed half an ounce of the acid with two ounces of calcined whiting, he obtained from it 350 ounce-measures of air; of which about one-third was fixed more in the first portions, and less in the last. The standard of the residuum in the first portions was 1.66, in the second 1.42, and in the third 1.38; which is very near the goodness of common air. The whiting then weighed 760 grains. On adding a quarter of an ounce more of radical vinegar, and repeating the operation, 120 ounce-measures of air were obtained, and the whiting was reduced to 730 grains. A third operation, in which another quarter of an ounce of vinegar was added, reduced the matter to 489 grains; but the last portion of air extracted had no fixed air, and was considerably better than that of the atmosphere.—The other experiment was made with lime-stone alone; from four ounces of the *white crystals*, of which 830 ounce-measures of air were obtained, the first portion of which had only one-fourth of fixed air, and the standard of the residuum was never better than 1.56, nor worse than 1.66; so that it was nearly of the goodness of common air.

Our author then proceeds to relate several other experiments in which the nitrous acid was decomposed; but a particular relation of them would swell this article beyond its due bounds. At last, however, he concludes in the following manner. “If spirit of nitre be made to boil, and its vapour received through a red-hot earthen tube, it will be converted into dephlogisticated air, in which a portion both of phlogisticated and fixed air is found, as Dr Priestley has discovered: the water through which this air passes will also contain fixed air. Here then are several ways of decomposing the nitrous acid; and in one only it is resolved into nitrous and dephlogisticated air; and in this way it may, at least, be strongly suspected to receive an addition of another principle. Why then should these be regarded as its constituent principles? And as in the two simplest methods of decomposition, in which the reaction of no foreign substance can be suspected, it appears in the form of dephlogisticated, phlogisticated, and fixed air (the former always containing a portion of the two last), why then should not these be accounted its true constituent parts?—This theory is further confirmed by reflecting on the manner in which nitrous acid is generated by nature. Mr Thouvenel found that this acid is constantly produced when chalk is exposed to a mixture of putrid air and common air, or putrid and dephlogisticated air; but if the putrid air be passed through lime-water, it is never generated; and that it is rarely produced by the exposure of quick-lime or fixed alkalis to these airs. The reason that alkalis, though aerated, are not so proper, is, that they do not combine with phlogisticated air as calcareous earths do. Mr Cavendish, indeed, produced nitrous acid without any apparent mixture of fixed air; but the atom of it necessary for the formation of the small quantity of nitrous acid he produced

N^o 2.

ced (about one-third of a grain), might well be contained in the phlogisticated air he employed, or perhaps formed in the operation.”

Having thus far stated the different opinions of the most celebrated French and English philosophers concerning the composition of acids, it is necessary to take notice of some experiments made by Mr Watt, in order to determine whether the dephlogisticated air produced from nitre really proceeds from a decomposition of the acid, or what quantity of the latter is required to constitute a determinate quantity of the former. To ascertain this*, 240 grains of mercury were put into a glass retort with 480 grains of diluted dephlogisticated nitrous acid, which was the quantity necessary to dissolve the whole of the mercury; and as soon as the common air was expelled, a proper vessel was applied to receive the air produced in the operation. Sixteen ounce-measures of nitrous air came over during the solution, and on changing the receiver, a quantity of dilute, but highly phlogisticated nitrous acid, was obtained. The air receiver being again applied, four ounce-measures of strong and pure nitrous air were obtained, which, by the dephlogisticated air that arose immediately after, were reduced to half an ounce-measure. The production of dephlogisticated air continued very rapid, the mercury being all the while received, until the operation was ended by the distillation or sublimation of the whole of the mercury. Two hundred and eighteen grains of the metal were obtained in its running form, and 22 remained in the form of an orange-coloured sublimate in the upper part of the retort.—The 16 ounce-measures of nitrous air, first obtained, were then converted into nitrous acid by the gradual admission of common air, and then added to the water in the basin in which the receiver had been inverted; the whole quantity being about two quarts, and very acid to the taste, sparkling at the same time with nitrous air. To determine the quantity of acid thus recovered, as well as that which remained in the sublimate, a solution of alkali of tartar was made; and by experiment it was found, that 120 grains of the acid, originally employed in dissolving the mercury, saturated 352 grains of this solution; the orange-coloured sublimate and all the acid liquor recovered being saturated by 1395 grains of the same. Hence it appears, by the rule of proportion, that out of 480 grains of nitrous acid originally employed, only five were lost; “a smaller quantity (as Mr Watt justly observes) than what might reasonably be supposed to be lost in the process by the extreme volatility of the nitrous acid.” His conclusion therefore is, that “the nitrous acid does not enter into the composition of dephlogisticated air: it seems only to serve to absorb phlogiston from the watery part of the mercurial nitre.”

This experiment was repeated with cubic nitre, and only 30 ounce-measures of air distilled from an ounce of the mineral alkali exactly saturated with nitrous acid. The water through which the air passed was acid, and the residuum in the retort alkaline; but on mixing the two together, the solution was found to be exactly neutral by every possible test.

Not satisfied with these experiments, Mr Watt distilled an ounce (480 grains) of common nitre, stopping the process when 50 ounce-measures of air had been produced. This air had a strong smell of the nitrous

10
Fixed air
one of the
elements of
nitrous acid.

11
How nitrous acid is
naturally
generated.

Acids.

12

Experiments by
Mr Watt, which
seem contrary to Mr
Kirwan's doctrine.
Philos. Transf.
v. lxxiv.
P. 339.

Acids. nitrous acid, from which it could not be freed by washing with the water in the basin. The residuum in the retort was alkaline as before, and the water slightly acid; nor was the saturation completed by mixing the two together. Ten grains of weak nitrous acid, 105 grains of which contained the acid of 60 of nitre, completed the saturation. These ten grains contained the acid of 57 grains of nitre; which, by Mr Kirwan's experiments, is equal to two grains of real nitrous acid. "We have therefore (says Mr Watt) 34 grains weight of dephlogisticated air produced, and only two grains of real acid missing; and it is not certain that even this quantity was destroyed, because some portion of the glass of the retort was dissolved by the nitre, and some part of the materials employed in making the glass being alkali, we may conclude, that the alkali of the nitre would be augmented by the alkali of that part of the glass it had dissolved; but as the glass cracked into small pieces on cooling, and some part of the coating adhered firmly to it, the quantity of the glass that was dissolved could not be ascertained."

¹³ To avoid the force of objections drawn from these experiments, and which seem ready to overthrow his hypothesis, as well as that of Mr Lavoisier entirely, Mr Kirwan makes the following reply.—"My ingenious friend Mr Watt, as well as Mr Cavendish, are of opinion, that the whole quantity of dephlogisticated air, produced from the distillation of nitre, arises from the dephlogistication of the water it contains, it being decomposed by the nitrous acid, which then becomes phlogisticated. This opinion is exposed to insurmountable difficulties. For, in the first place, nitre affords dephlogisticated air at the rate of 146.125 cubic inches for every 100 grains of nitre, which by the proper allowances for phlogisticated air, should weigh 46.77 grains: but then dephlogisticated air is only one of the constituent parts of water, for it contains 13 per cent. of inflammable air, that is to say, 87 grains of dephlogisticated air: to form 100 grains of water requires an addition of 13 grains of inflammable air; consequently 46.77 grains of dephlogisticated air require nearly 7 of inflammable air, and would then form 53.77 grains of water, which exceeds half the weight of the nitre; a quantity of water, as Mr Watt owns, certainly inadmissible. Mr Watt found, that the water over which the air proceeding from the decomposition of 960 grains of nitre had been received, contained only the acid belonging to 120 grains of nitre; and even this small quantity he inferred only from my experiments. But my experiments are totally inapplicable in this case; for I used only the dephlogisticated nitrous acid: and alkalis are saturable by a much smaller quantity of phlogisticated than of dephlogisticated acids, as is evident in the case of the *dephlogisticated marine acid*, as Stahl long ago observed; for he says, that the volatile acid of sulphur saturates ten times as much alkali as the fixed. Mr Bergman and Mr Scheele observed, that melted nitre is still neutral, though it be phlogisticated; therefore it is air, and not water, which it wants. Accordingly Dr Priestley found it to injure common air by attracting its dephlogisticated part: but if it be kept in fusion for some time, it loses its acid, and becomes alkaline; and the air it receives must surely be deemed rather to recompose the acid than to form water; of whose for-

Vol. I. Part I.

mation, in the temperature of the atmosphere, we have no sort of proof. On the contrary, the impossibility of accounting for the loss of acid in this case is an evident proof of the fallacy of that hypothesis.

—By Mr Lavoisier's analysis, 100 grains of nitre contain 57 of caustic alkali; by Mr Bergman's, 49; by Mr Wenzel's, 52; by Mr Wiegand's 46½; by mine, 63: the mean of all which is, 53½; which leaves 46.5 for acid and water, which is very nearly the weight of the air expelled. The different quantity of acid assigned by different persons to nitre, is in part owing to its degree of phlogistication in nitre. I believe at present, that 100 grains of nitre contain 34 of acid and about 12 of water, including the water in the acid and that of crystallization."

Mr Kirwan next proceeds to consider, in a manner similar to that above related, the composition of the other acids.—The marine acid, according to him, consists of a peculiar basis united to phlogiston, and a certain quantity of fixed air; to both of which the basis seems to have a strong affinity. On depriving it of this phlogiston, the affinity of the acid to fixed air becomes much stronger, and it saturates itself so largely with it, that its attractions for other substances, containing little or no phlogiston, become nearly as weak as those of fixed air itself when equally condensed; but with respect to bodies that contain a considerable quantity of phlogiston, its affinities are much stronger, as its basis attracts the phlogiston, while those bodies attract its excess of fixed air. In this state it does not expel fixed air from aerated fixed alkalis or earths until it is heated; and then dephlogisticated air separates from it, and it becomes, in all respects, common marine acid. For as it contains an excess of fixed air, it acts nearly as an acid of the same nature; but when heat is applied, its basis dephlogisticates its own fixed air, which then becomes dephlogisticated air, at the same time that the acid becomes common marine acid, and acts as such.

Mr Lavoisier, and other philosophers, who deny the existence of phlogiston, are of opinion, that the common marine acid consists of a peculiar basis united to a small proportion of pure air, or oxygenous principle, and the dephlogisticated marine acid differs from it only by containing an excess of this principle.—This opinion they are chiefly induced to maintain, because the acid in its dephlogisticated state is procured by distilling common marine acid from manganese; and the manganese, if distilled by itself, before the acid is distilled from it, affords dephlogisticated air; but after the acid is distilled from it, it yields none.—"This experiment, however, (says Mr Kirwan), proves no more but that the manganese contains some air which is dephlogisticated during the calcination. And that this air is fixed air, appears from the following considerations: The black calx of manganese almost always gives out fixed air at first, before any dephlogisticated air appears; whence it is natural to think, that the dephlogisticated air proceeds from the dephlogistication of the fixed. And hence, if it be distilled with filings of iron, or in a gun-barrel, it scarce gives out any other than fixed air; if at any time it gives out dephlogisticated air, with little or no mixture of fixed air, this is owing to a very perfect dephlogistication of the calx, and to its containing very little moisture. Thus Dr Priestley, having

Acids.

¹⁴ Quantity of acid contained in nitre.

¹⁵ Principles of the marine acid.

¹⁶ Mr Lavoisier's opinion.

¹⁷ Contested by Mr Kirwan.

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Acids.

having passed the steam of boiling water through manganese heated in an earthen tube, obtained a very large quantity of fixed air, and scarce any other; though on repeating this experiment with manganese well freed from calcareous earth, I obtained a large portion of dephlogisticated air; but I believe much depends on the degree of heat to which the tube is subjected. But having distilled manganese, which yielded of itself some fixed air with common spirit of salt, I obtained dephlogisticated marine acid, and not a particle of fixed air; which shows that this last combined with the dephlogisticated basis, and formed the dephlogisticated acid. Mr Hermstadt having dissolved the black calx in common marine acid, and precipitated it with an aerated fixed alkali, obtained, as usual, a white precipitate; which, when heated, afforded a great part of the fixed air it had absorbed from the alkali; but when heated to such a degree as to be of a brown red colour, and consequently dephlogisticated, it converted common spirit of salt into a dephlogisticated acid, which could proceed only from some fixed air yet unexpelled: Yet if sal-ammoniac be distilled with the black calx of manganese, it will be expelled in a caustic state; for the fixed air unites to the dephlogisticated marine basis in preference to the volatile alkali."

18
Decisive ex-
periment in
his favour.

Several other experiments are related by Mr Kirwan, which the limits of this article will not allow us to insert; but the following, he is of opinion, fully confirms his hypothesis, and subverts that of the antiphlogistians. "Six cubic inches of inflammable air were mixed with as much dephlogisticated marine air over lime-water. In about 10 minutes after the greater part of the diminution had taken place, a white cloud appeared on the surface (a) of the lime-water, and by agitation it became still more turbid. As it was possible that the manganese might be mixed with calcareous earth, some dephlogisticated marine air was extracted from another portion of it, and received on lime-water; but it was wholly absorbed, without forming the least cloud, tho' there was lime enough; for, on adding aerated water, a cloud appeared."

19
Phosphoric
acid.

The other acids particularly treated of by Mr Kirwan are the phosphoric and saccharine. In his treatise on the former, he adopts the analysis of Mr Lavoisier, changing only his acid principle of dephlogisticated for fixed air. From this it appears, that the phosphoric acid consists of a peculiar basis united to 2.265 of its weight of the acid principle; or, in other words, 100 grains of dry phosphoric acid contains about 69 of fixed air and 31 of its peculiar basis: 100 grains of the phosphoric basis take up 226.5 of fixed air, or 32.9 of phlogiston when it becomes phosphorus; and 100 grains of phosphorus contain 75.24 of basis and 24.76 of phlogiston.—The basis of this acid is the only one that can be procured free, both from the phlogiston and the acidifying principle; it is called, though improperly, as it is not soluble in water, the *glacial phosphoric acid*. Mr Lavoisier and others are of opinion, that phosphorus is a simple substance containing no phlogiston, and that the acid consists of the oxygenous principle united to it.

Acids.

20

Saccharine
acid.

With regard to the acid of sugar, Mr Kirwan observes, that sugar itself is a compound of fixed air with a much larger proportion of inflammable air, and some water, all condensed to a degree of which we are ignorant, but retaining, upon the whole, much more specific heat than either oil or charcoal; though he seems inclined to the hypothesis of Mr Morveau, that this substance has for its basis a fine etherial oil, to which a large proportion of condensed inflammable air is superadded. The acid of sugar, then, according to him, consists of this peculiar basis deprived of its superfluous phlogiston, and united to a great quantity of fixed air in a concrete state. He is also of opinion, that it does not exist ready formed in the sugar, but is produced in the operations that substance undergoes: that it derives most of its acid principle from the nitrous acid employed; the nitrous basis taking up the phlogiston, and the fixed air of the nitrous acid combining with the saccharine basis. He contests strongly an opinion of Mr Lavoisier, that sugar is a sort of *charcoal*, which, uniting with the oxygenous principle of the nitrous acid, decomposes it, sets loose the nitrous air, and forms the saccharine acid; and that, towards the end of the operation, the saccharine acid itself is decomposed; the consequence of which is the production of fixed air, which, according to him, is only the oxygenous principle combined with charcoal. On this Mr Kirwan remarks, 1. "That, according to this theory, the acid of sugar should be the same with fixed air, since both are composed of the oxygenous principle united with charcoal: or, if Mr Lavoisier should reply, that sugar is different from common charcoal, he reminds him, that, according to his own table of affinities, the oxygenous principle has a much stronger attraction for charcoal than for sugar, and consequently that the latter ought to be decomposed by the former; nay, that it should be regenerated by various metallic substances, which, according to him, have a greater attraction for this principle. 2. According to this hypothesis, the saccharine acid ought to weigh more than the sugar employed in the operation; which is so far from being the case, that it is universally agreed to be much less; Bergman making it only $\frac{1}{3}$ d, Mr Chaptal from $\frac{1}{3}$ d to $\frac{2}{3}$ ths, and Mr Sage $\frac{1}{8}$ ths. 3. If the saccharine acid consisted of sugar, or consisted of that substance undecomposed, and barely united to the oxygenous principle, it ought to be formed by treating sugar with the black calx of manganese, or with dephlogisticated marine acid; both of which, according to him, have less attraction for the oxygenous principle than sugar. Lastly, (says Mr Kirwan), If the acid of sugar be distilled, it is wholly converted into water, fixed inflammable air, and not a particle of coal or dephlogisticated air is found in it. It is not therefore reasonable to look on either of them as its constituent principles; but as fixed air alone can be extracted from all vegetable acids, it seems to be the true acidifiable principle."

21

Fixed air
the acid
principle,
according
to Mr Kir-
wan.

Having given a view of the present opinions relative to the original formation of acids, it remains to treat a little more particularly of each of the different kinds.

(a) On mixing these, a dense white cloud appears; one half the bulk of both disappears, and the residuum explodes like a mixture of inflammable and dephlogisticated air.

Acids. kinds. They are divided into three different classes, expressive of their origin, viz. the Mineral, Vegetable, and Animal. The mineral acids are those of vitriol, nitre, sea-salt, borax, amber, fluor, arsenic, tungsten, molybdæna, &c. The vegetable are, those of vinegar, tartar, sugar, benzoin, apples, citrons, lemons, tamarinds, sorrel, cork, &c. The animal acids are, the microsmic or acid of urine, and that of bones, both of which are also called the *phosphoric*, though this might be accounted a vegetable acid, as it is procured by distilling mustard and some other vegetables by a violent fire. Besides these, there are the acids of ants, wasps, bees, silk-worms, milk, &c. It has also been discovered, that the human calculus is formed for the most part of a peculiar acid, which has received the name of *lithiatic* acid. Lastly, As an acid distinct from all these, we may now add *fixed air*, by some called the *aerial*, and by others the *cretaceous* acid; the latter appellation it derives from *creta*, chalk, because it is found in that substance in great quantity. See AEROLOGY.

General account of their attractions for alkalis, &c. The general properties of acids have already been enumerated; the most remarkable of which is their attraction for alkaline salts, earths, and metals. Though this is common to all, yet very considerable differences are observed among them in this respect, and on those differences depend almost all the phenomena of that part of CHEMISTRY which treats of salts. As these phenomena are particularly considered under that article, we shall here only in general take notice, that the three acids named the *vitriolic*, *nitrous*, and *marine*, are the strongest of them all; that is, if any other acid be united to an alkali, earth, or metal, the union will be broken by adding to that compound any of the three acids just mentioned. Neither are these equal in power among themselves; for the vitriolic is stronger than the nitrous, and the nitrous stronger than the marine. The rule, however, is liable to certain exceptions and variations, depending chiefly on the circumstances of heat or cold, moisture or dryness, and particularly on the state of the marine acid with regard to its being in the form of an aqueous fluid or reduced to a dry vapour. In this last case it seems stronger than either the vitriolic or nitrous; and even when in an aqueous state, both the nitrous and marine acids, when added in great quantity, seem to oppress and overwhelm the stronger vitriolic acid, so that they will partly expel it from an alkaline salt. This does not depend on the mere quantity of acidity they possess: for the acetous acid may be concentrated to such a degree as to become stronger in this respect than spirit of salt; yet it will always be inferior in point of real strength, when tried with an alkali in competition with the latter. The aerial acid is the weakest of all; and may be expelled not only by vinegar, but by the acid juices of fruits, tartar, and the acids of tungsten and molybdæna.

Some acids have the property of resisting the fire, and melting into a kind of glass, such as that of borax and phosphorus. This circumstance gives them an advantage over the stronger acids which are volatile; and thus the two just mentioned, as well as those of arsenic and tungsten, will, in a very strong heat, expel the acid of vitriol itself, though the latter will, in the cold, expel any one of them with great ease.

Both the vitriolic and nitrous acids have a very strong

attraction for phlogiston; and unite with certain oily and inflammable matter so vehemently as to occasion great heat, and sometimes even violent and unextinguishable flame. This is particularly the case with the nitrous acid, or with a mixture of the two; and indeed the nitrous acid, though weaker than the vitriolic, shows itself in every instance to be far more active, and to perform all its operations with vastly greater rapidity, than the other. All these particulars, however, as they properly fall under the article CHEMISTRY, are there explained at length: together with the origin and peculiar methods of preparing each of the acids, and the various uses to which they may be applied in arts and manufactures. See also their different titles as they occur in the order of the alphabet; as, NITRE, VINEGAR, VITRIOL, &c.

ACIDULOUS denotes a thing that is slightly acid; it is synonymous with the word *sub-acid*.

ACIDULÆ. Mineral waters that contain a brisk spirit, when unaccompanied with heat, are thus named; but if they are hot also they are called THERMÆ. See MINERAL WATERS.

ACIDULATED, a name given to medicines that have an acid in their composition.

ACIDUM AEREUM, the same with *Fixed Air*.

ACIDUM pingue, an imaginary acid, which some German chemists supposed to be contained in fire, and by combining with alkalis, lime, &c. to give them their caustic properties; an effect which is found certainly to depend on the loss of their fixed air.

ACILA, OCILA, or OCELIS (anc. geog.), a staple or mart town in Arabia Felix, on the Arabic gulf, from which, according to Pliny, they set sail for India. Now Ziden.

ACILIUS GLABRIO (Marcus), consul in the year of Rome 562, and 211 years before the Christian æra, distinguished himself by his bravery and conduct in gaining a complete victory over Antiochus the Great, king of Syria, at the straits of Thermopylæ in Thessaly, and on several other occasions. He built the Temple of Piety at Rome, in consequence of a vow he made before the above mentioned battle: and the reason of his giving it that name is very remarkable. The story is mentioned by Pliny, Valerius Maximus, and others. See the article PIETY.

ACINIPPO (anc. geog.), a town of Bætica; its ruins, called *Ronda la Vieja*, are to be seen near Arunda, in the kingdom of Granada.

ACINODENDRUM, in botany, the trivial name of a species of MELASTOMA.

ACINOS, in botany, the trivial name of a species of THYMUS.

ACINUS, or ACINI, the small protuberances of mulberries, strawberries, &c. and by some applied to grapes. Generally it is used for those small grains growing in bunches, after the manner of grapes, as *Ligustrum*, &c.

ACIS, in fabulous history, the son of Faunus and Simetheis, was a beautiful shepherd of Sicily, who being beloved by Galatea, Polyphemus the giant was so enraged, that he dashed out his brains against a rock; after which Galatea turned him into a river, which was called by his name.

Acis, (Ovid, Theocritus); a river of Sicily, running from a very cold spring, in the woody and shady

Acknowledgment
||
Acoemetæ.

foot of mount *Ætna*, eastward into, and not much above a mile from, the sea, along green and pleasant banks, with the speed of an arrow, from which it takes its name. It is now called *Acì Iaci*, or *Chinci*, according to the different Sicilian dialects: Antonine calls it *Acìus*. Also the name of a hamlet at the mouth of the *Acis*.

ACKNOWLEDGMENT, in a general sense, is a person's owning or confessing a thing; but, more particularly, is the expression of gratitude for a favour.

ACKNOWLEDGMENT-Money, a certain sum paid by tenants, in several parts of England, on the death of their landlords, as an acknowledgment of their new lords.

ACLIDES, in Roman antiquity, a kind of missive weapon, with a thong affixed to it, whereby to draw it back. Most authors describe it as a sort of dart or javelin; but Scaliger makes it roundish or globular, and full of spikes, with a slender wooden stem to poise it by.

ACLOWA, in botany, a barbarous name of a species of *COLUTEA*. It is used by the natives of Guinea to cure the itch: They rub it on the body as we do unguents.

ACME, the top or height of any thing. It is usually applied to the maturity of an animal just before it begins to decline; and physicians have used it to express the utmost violence or crisis of a disease.

ACMELLA, in botany, the trivial name of a species of *SPILANTHUS*.

ACMONIA, and **AGMONIA**, in Peutinger's map, a town of Phrygia Major, now in ruins. The inhabitants are called *Acmonenses* by Cicero, and the city *Civitas Acmonensis*. Also a city of Dacia (Ptolemy), on the Danube, near the ruins of Trajan's bridge, built by Severus, and called *Severicum*; distant 12 German miles from Temeswar, to the south-east.

ACNITA, **VIRGINIAN HEMP**, in botany, a genus of the diœcia order, belonging to the pentandria class of plants; and, in the Natural Order, associating with the *Scabridæ* (53.) The characters are: In the *male*, the *calyx* is a perianthium consisting of five leaves, ovate, concave, acute, and membranous on the margin. No *corolla*. The *stamina* consist of five very short capillary filaments; the antheræ are versatile, two-celled, and forked at both ends.—*Female* on a separate plant; of which the *calyx* consists of an involucre many-leav'd, linear, and deciduous; and a perianthium two-leaved, very small, and persistent. No *corolla*. The *pisillum* has an ovate germen; the styli are five, long, reflected, and downy; the stigmata are simple. The *pericarpium* is an egg-shaped fruit, compressed, many-angled, sulcated, and covered with a succulent calyx. The *seed* is solitary, round, and compressed. There is only one species of it, viz. the *acnida cannabina*. It is a native of Virginia; but rarely cultivated in Europe, except for the sake of variety. It has little beauty, and at present is applied to no useful purpose.

ACNUA, in Roman antiquity, signified a certain measure of land, near about the English rood, or fourth part of an acre.

ACOEMETÆ, or **ACOEMETI**, in church-history; or, Men who lived without sleep: A set of monks who chanted the divine service night and day in their pla-

ces of worship. They divided themselves into three bodies, who alternately succeeded one another, so that their churches were never silent. This practice they founded upon the precept, *Pray without ceasing*. They flourished in the east about the middle of the 5th century. There are a kind of acoemeti still subsisting in the Roman church, viz. the religious of the holy sacrament, who keep up a perpetual adoration, some one or other of them praying before the holy sacrament day and night.

ACOLUTHI, or **ACOLUTHISTS**, in antiquity, was an appellation given to those persons who were steady and immoveable in their resolutions: and hence the stoics, because they would not forsake their principles, nor alter their resolutions, acquired the title of Acoluthi. The word is Greek, and compounded of α , priv. and $\kappa\alpha\lambda\upsilon\theta\omicron$, way; as never turning from the original course.

ACOLUTHI, among the ancient Christians, implied a peculiar order of the inferior clergy in the Latin church; for they were unknown to the Greeks for above 400 years. They were next to the sub-deacon; and we learn from the fourth council of Carthage, that the archdeacon, at their ordination, put into their hands a candlestick with a taper, giving them thereby to understand that they were appointed to light the candles of the church; as also an empty pitcher, to imply that they were to furnish wine for the eucharist. Some think they had another office, that of attending the bishop wherever he went. The word is Greek, and compounded of α , priv. and $\kappa\alpha\lambda\upsilon\omega$, to hinder or disturb.

ACOLYTHIA, in the Greek church, denotes the office or order of divine service; or the prayers, ceremonies, hymns, &c. whereof the Greek service is composed.

ACOMA, a town of North America, in New Mexico, seated on a hill, with a good castle. To go into the town, you must walk up 50 steps cut out of the rock. It is the capital of that province, and was taken by the Spaniards in 1599. W. Long. 104. 15. Lat. 35. 0.

ACOMAC, the name of a county in Virginia. It is on the eastern side of the Chesapeake bay, on a slip of land, by the Virginians called the *eastern shore*.

ACOMINATUS (Nicetas), was secretary to Alexius Comnenus and to Isaacus Angelus successively: he wrote an history from the death of Alexius Comnenus 1118, where Zonaras ended his, to the year 1203, which has undergone many impressions, and is much applauded by the best critics.

ACONITE. See **ACONITUM**.

Winter ACONITE. See **HELEBORUS**.

ACONCROBA, in botany, the indigenous name of a plant which grows wild in Guinea, and is in great esteem among the natives for its virtues in the small-pox. They give an infusion of it in wine. The leaves of this plant are opaque, and as stiff as those of the phillyrea; they grow in pairs, and stand on short footstalks; they are small at each end, and broad in the middle; and the largest of them are about three inches in length, and an inch and quarter in breadth in the middle. Like those of our bay, they are of a dusky colour on the upper side, and of a pale green underneath.

ACONITI,

Acoluthi
||
Aconcroba.

Aconiti,
Aconitum. **ACONITI**, in antiquity, an appellation given to some of the *ATHLETÆ*, but differently interpreted. Mercurialis understands it of those who only anointed their bodies with oil, but did not smear themselves over with dust, as was the usual practice.

ACONITUM, **ACONITE**, **WOLFSBANE**, or **MONKSHOOD**; a genus of the trigynia order, belonging to the polyandria class of plants. In the natural order, it associates with the *Multiflorae*, 26. The characters are: There is no *calyx*: The *corolla* consists of five unequal petals opposite in pairs; the highest helmet-tubed, inverted, and obtuse; the two lateral ones, broad, roundish, opposite, and converging; the two lowest, oblong, and looking downwards: The *nectaria* are two, piped, nodding, and sitting on long subulated peduncles, and concealed under the highest petal: The scales are six, very short, coloured, and in an orb with the *nectaria*: The *stamina* consist of numerous small subulated filaments; the antheræ are erect and small: The *pistillum* has three [five] oblong germens, ending in styli the length of the *stamina*; the *stigmata* are simple and reflected: The *pericarpium* has three or five univalve capsules gaping inward: The *seeds* are numerous, angular, and wrinkled.

Species. 1. The *lycoctonum*, or yellow wolfsbane, grows upwards of three feet high, flowers about the middle of June, and if the season is not warm will continue in flower till August. 2. The *altissimum*, or greatest yellow wolfsbane, grows upwards of four feet high, and the spikes of its flower are much longer in this sort than the former. 3. The *variegatum*, or lesser wolfsbane, seldom grows more than two feet high; it carries blue flowers, and the spikes of them are much shorter than either of the two last. 4. The *anthora*, or wholesome wolfsbane, flowers in the middle of August, and often continues in beauty till the middle of September; its flowers are not large, but are of a beautiful sulphur-yellow colour. 5. The *napellus*, bears large blue flowers, which appear in August, and make a pretty appearance. There are two or three varieties of this kind; one with white, another with rose coloured, and a third with variegated flowers; but these are only varieties which often change. 6. The *pyramidale*, or common blue monkhood, bears a long spike of blue flowers, which appear sooner than any of the other sorts, being so early as June, or sometimes even May. The spikes of flowers are upwards of two feet long, so that it makes a pretty appearance: the seeds are ripe in September. 7. The *alpinum*, or large-flowered monkhood, flowers in August, and will grow to the height of five feet in good ground; the flowers are very large, of a deep blue colour, but not many upon each spike. 8. The *pyreniacum*, or Pyrenean monkhood, flowers in July. It grows about four feet high, and carries a long spike of yellow flowers. 9. The *cammarum*, grows about four feet high, and flowers in the beginning of July. 10. The *orientale*, or eastern monkhood, grows sometimes more than six feet high, and bears a white flower.

Culture. All these species, except the last, are natives of the Alps, the mountains of Germany, Austria, and Tartary; so require a cool shady situation, except the wholesome wolfsbane, which must have an open exposure. They thrive better in a moist than dry soil: but the ground must not be so wet as to have the

water standing near their roots in the winter-time. *Aconitum.* They may all be propagated by sowing their seeds in autumn, upon a north border, where they are screened from the sun. The plants will come up in the spring, when they must be kept clean from weeds during the summer-months; and, in very dry seasons, if they are frequently refreshed with water, their growth will be greatly promoted. The following autumn they should be transplanted into shady borders, in rows a foot asunder, and the plants six inches distant from one another. In this situation they may remain two years, when they will carry flowers, and so may be transplanted to those places where they are to remain. The eastern monkhood is a native of the Levant, from whence the seeds of it were first sent by Dr Tournefort to the royal garden at Paris, from whence some other gardens have been furnished with seeds. It is very rare in Europe at present.

Qualities. Since the time of Theophrastus, most of the species of monkhood have been reckoned a deadly poison both to men and brutes. Dioscorides, however, recommends the external application of common monkhood for pains of the eyes. The flowers of a great many species communicate their noxious quality by being smelled to; and those of the species called *napellus* being placed on the head, occasion a violent megrim. Of the bad qualities of these plants we sometimes avail ourselves to get rid of vermin. A decoction of the roots destroyed bugs; the same part being powdered, and administered in bread or some other palatable vehicle to rats and mice, corrodes and inflames their intestines, and soon proves mortal. The juice of the plant is used to poison flesh with, for the destruction of wolves, foxes, and other ravenous beasts. The best antidote to the poison of the different monkhoods is said to be the root of the *anthora*, a species of the same genus, hence termed *healthful* or *wholesome monkhood*. The same plant is regarded as efficacious against bites of serpents and other venomous creatures. The roots have a bitter acrid taste; the leaves are only bitter: the former are chiefly used in medicine; and, besides the excellent quality just mentioned, are stomachic, and promote perspiration. The peasants, who gather the plants on the Alps and Pyrenees, are said to use it with success against the biting of mad dogs, and to cure the colic. It is remarkable, that the monkhoods with blue flowers are much more virulent than the yellow or white-flowered kinds. Miller asserts that the huntsmen of the wolves and other wild beasts on the Alps, dip their arrows into the juice of those plants, which renders the wounds made by them deadly.

That the *anthora* is an antidote to the poison of the rest of the species, is not considered as a fact sufficiently established. Of the effects of the above, indeed, and other vegetable poisons, medical writers give but a confused account. In general, those which are not of the narcotic kind, nor excite violent vomitings and purgings, produce their pernicious effects by irritating the nervous coats of the stomach and intestines, so as to occasion violent convulsions, not only in them, but through the whole body. The proper cure is evacuation by vomit: but this is not to be obtained without some difficulty; because there is usually such a contraction about the upper orifice of the stomach, that nothing

Acontias
||
Acorus.

thing can either be swallowed or thrown up. In this case, an infusion of tobacco has been recommended, and may probably be of service: for being itself of a very stimulating nature, it may for a moment take off the violent spasms occasioned by the poison; in which case, a violent vomiting will immediately ensue.—The stomach being thoroughly emptied, and deglutition rendered easy, the cure may be completed by oily and mucilaginous medicines. On account of the poisonous qualities of monkshood, no species of it should be planted where children have access, lest they should suffer by putting the leaves or flowers in their mouths, or rubbing them about their eyes; for the juice of the leaves will occasion great disorder by being only rubbed upon very tender flesh; and the farina of the flowers, when blown into the eyes, causes them to swell greatly.

ACONTIAS, in zoology, an obsolete name of the *anguis jaculis*, or dart-snake, belonging to the order of *amphibia serpentes*. See *ANGUIS*.

ACONTIUM, *ακοντιον*, in Grecian antiquity, a kind of dart or javelin, resembling the Roman pilum.

ACONTIUS (James), a philosopher, civilian, and divine, born at Trent in the 16th century: he embraced the reformed religion: and coming into England in the reign of Queen Elizabeth, was much honoured by her, which he acknowledges in a book dedicated to that queen. This work is his celebrated *Collection of the Stratagems of Satan*, which has been so often translated, and borne so many editions.

ACOSTAN, a mountainous island in the north seas between Asia and America, observed by Captain Cook.

ACORN, the fruit of the oak-tree. See *QUERCUS*.

ACORN (in sea-language), a little ornamental piece of wood, fashioned like a cone, and fixed on the uppermost point of the spindle, above the vane, on the mast-head. It is used to keep the vane from being blown off from the spindle in a whirlwind, or when the ship leans much to one side under sail.

ACORUS, *CALAMUS AROMATICUS*, SWEET FLAG, or SWEET RUSH: A genus of the monogynia order, belonging to the hexandria class of plants; and ranking in the second natural order, *Piperita*. The characters are: The *calyx* is a cylindric simple spadix covered with florets: There is no *spatha*, nor *perianthium*: The *corolla* is composed of six obtuse, concave, loose petals: The *stamina* consist of six thickish filaments, somewhat longer than the corolla; the antheræ are thickish and didymous: The *pisillum* has a gibbous oblong germen the length of the stamina; no stylus; the stigma a prominent point: The *pericarpium* is a short triangular, obtuse, three-celled capsule, attenuated at both ends: The seeds are numerous, and of an oblong egg-shape.

There is but one species, the *acorus calamus*. It grows naturally in shallow standing waters, and is found wild in some parts of Britain. It grows plentifully in rivulets and marshy places about Norwich and other parts of this island, in the canals of Holland, in Switzerland, and in other countries of Europe. The shops have been usually supplied from the Levant with dried roots, which do not appear to be superior to those of our own growth. The leaves are sometimes two feet long, narrow, compressed, smooth, and of a bright green,

terminating in a point; the root is pretty long, of a whitish, reddish, and partly greenish colour. Among the leaves there arises a single one, thicker and more robust than the rest, furrowed on the surface, and of a paler green. On this grow frequently two spikes of flowers, by many writers called *juli*. These are of a brown colour, having a chequered surface. The root of this plant has a very agreeable flavour, which is greatly improved by drying. It is reckoned carminative and stomachic, having a warm, pungent, bitterish taste; so is frequently used as an ingredient in bitters. It has been complained of, however, as communicating a nauseous flavour to those bitters in which it was infused; and Neumann observes, that its agreeable flavour, as well as its distinguishing taste, reside entirely in a volatile essential oil; the residuum after distillation having a nauseous flavour, not at all resembling that of the calamus. It is an ingredient in the methridate and theriaca of the London pharmacopœia; and in the aromatic and stomachic tinctures, and compound arum powder, of the Edinburgh. The fresh root candied is said to be employed at Constantinople as a preservative against epidemic diseases. The leaves of this plant have a sweet fragrant smell, more agreeable, though weaker, than that of the roots. Neither horses, cows, goats, sheep, nor swine, will eat the herb or its roots.

Culture. The *acorus* being a perennial plant, may be transplanted into a garden, where it will thrive very well if the ground is moist; but never flowers unless it grows in water. It loves an open situation, and will not thrive well under the shade of trees. The flowers appear the latter end of June, and continue till August.

ACORUS, in the materia medica, a name sometimes given to the great galangal. See *KEMPFERIA*.

ACORUS, in natural history, blue coral. The true sort is very scarce; some, however, is fished on the coasts of Africa, particularly from Rio del Re to the river of the Camarones. This coral is part of the merchandise which the Dutch trade for with the Camarones: that of the kingdom of Benin is also very much esteemed. It grows in form of a tree on a rocky bottom.

ACOUSMATICI, sometimes also called *Acoustici*, in Grecian antiquity, such of the disciples of Pythagoras as had not completed their five years probation.

ACOUSTIC, in general, denotes any thing that relates to the ear, the sense of hearing, or the doctrine of sounds.

Acoustic Duct, in anatomy, the same with *meatus auditorius*, or the external passage of the ear. See *ANATOMY*.

Acoustic Instrument, or auricular tube. See *ACOUSTICS*, n° 26.

Acoustic Vessels, in the ancient theatres, were a kind of vessels, made of brass, shaped in the bell fashion, which being of all tones within the pitch of the voice or even of instruments, rendered the sounds more audible, so that the actors could be heard through all parts of theatres, which were even 400 feet in diameter.

Acoustic Disciples, among the ancient Pythagoreans, those more commonly called *ACOUSMATICI*.

The Science of

ACOUSTICS

Acorus
||
Acoustic.

A C O U S T I C S

¹ *Diacoustics.* **I**NSTRUCTS us in the nature of sound. It is divided by some writers into *Diacoustics*, which explains the properties of those sounds that come directly from the sonorous body to the ear; and *Catacoustics*, which treats of reflected sounds: but such distinction does not appear to be of any real utility.

CHAP. I. *Different Theories of Sound.*

³ *Of the vehicle of sound.* MOST sounds, we all know, are conveyed to us on the bosom of the air. In whatever manner they either float upon it, or are propelled forward in it, certain it is, that, without the vehicle of this or some other fluid, we should have no sounds at all. Let the air be exhausted from a receiver, and a bell shall emit no sound when rung in the void; for, as the air continues to grow less dense, the sound dies away in proportion, so that at last its strongest vibrations are almost totally silent.

⁴ *Air not the only one.* Thus air is a vehicle for sound. However, we must not, with some philosophers, assert, that it is the only vehicle; that, if there were no air, we should have no sounds whatsoever: for it is found by trial, that sounds are conveyed through water almost with the same facility with which they move through air. A bell rung in water returns a tone as distinct as if rung in air. This was observed by Derham, who also remarked that the tone came a quarter deeper. Some naturalists assure us also, that fishes have a strong perception of sounds, even at the bottom of deep rivers (A). From hence, it would seem not to be very material in the propagation of sounds, whether the fluid which conveys them be elastic or otherwise. Water, which, of all substances that we know, has the least elasticity, yet serves to

carry them forward; and if we make allowance for the difference of its density, perhaps the sounds move in it with a proportional rapidity to what they are found to do in the elastic fluid of air.

One thing however is certain, that whether the fluid which conveys the note be elastic or non-elastic, whatever sound we hear is produced by a stroke, which the sounding body makes against the fluid, whether air or water. The fluid being struck upon, carries the impression forward to the ear, and there produces its sensation. Philosophers are so far agreed, that they all allow that sound is nothing more than the impression made by an elastic body upon the air or water (B), and this impression carried along by either fluid to the organ of hearing. But the manner in which this conveyance is made, is still disputed: Whether the sound is diffused into the air, in circle beyond circle, like the waves of water when we disturb the smoothness of its surface by dropping in a stone; or whether it travels along, like rays diffused from a centre, somewhat in the swift manner that electricity runs along a rod of iron. These are the questions which have divided the learned.

⁶ Newton was of the first opinion. He has explained the progression of sound by an undulatory, or rather a vermicular, motion in the parts of the air. If we have an exact idea of the crawling of some insects, we shall have a tolerable notion of the progression of sound upon this hypothesis. The insect, for instance, in its motion, first carries its contractions from the hinder part, in order to throw its fore part to the proper distance, then it carries its contractions from the fore part to the hinder to bring that forward. Something similar to this is

(A) Dr Hunter has proved this, and demonstrated the auricular organ in these animals. See FISH, and *COMPARATIVE Anatomy*.

(B) Though air and water are both vehicles of sound, yet neither of them seems to be so by itself, but only as it contains an exceedingly subtle fluid capable of penetrating the most solid bodies. Hence, by the medium of that fluid, sounds can be propagated through wood, or metals, even more readily than through the open air. By the same means, deaf people may be made sensible of sounds, if they hold a piece of metal in their mouth, one end of which is applied to the sounding body. As it is certain, therefore, that air cannot penetrate metals, we must acknowledge the medium of sound to be of a more subtle nature; and thus the electrical fluid will naturally occur as the proper one. But why then is sound no longer heard in an exhausted receiver, if the air is not the fluid by which it is conveyed, seeing the electrical matter cannot be excluded? The reply to this is obvious: The electrical fluid is so exceedingly subtle, and pervades solid bodies with so much ease, that any motion of a solid body in a quantity of electric matter by itself, can never excite a degree of agitation in it sufficient for producing a sound; but if the electric fluid is entangled among the particles of air, water, wood, metal, &c. whatever affects their particles will also affect this fluid, and produce an audible noise. In the experiment of the air-pump, however, there may be an ambiguity, as the gradual exhausting of the air creates an increasing difference of pressure on the outside, and may occasion in the glass a difficulty of vibrating, so as to render it less fit to communicate to the air without the vibrations that strike it from within. From this cause the diminution of sound in an exhausted receiver may be supposed to proceed, as well as from the diminution of the air. But if any internal agitation of its parts should happen to the electrical fluid, exceeding loud noises might be propagated through it, as has been the case when large meteors have kindled at a great distance from the earth. It is also difficult to account for the exceeding great swiftness of sound, upon the supposition that it is propagated by means of air alone; for nothing is more certain, than that the strongest and most violent gale is, in its course, inert and sluggish, compared with the motion of sound.

Different
Theories of
Sound.

Plate I.
fig. 1.

is the motion of the air when struck upon by a sounding body. To be a little more precise, suppose ABC the string of an harpsichord screwed to a proper pitch, and drawn out of the right line by the finger at B. We shall have occasion elsewhere to observe, that such a string would, if let go, vibrate to E; and from E to D, and back again; that it would continue thus to vibrate like a pendulum for ever, if not externally resisted, and, like a pendulum, all its little vibrations would be performed in equal times, the last and the first being equally long in performing; also, that, like a pendulum, its greatest swiftness would always be when it arrived at E, the middle part of its motion. Now then, if this string be supposed to fly from the finger at B, it is obvious, that whatever be its own motion, such also will be the motion of the parts of air that fly before it. Its motion, as is obvious, is first uniformly accelerated forward from B to E, then retarded as it goes from E to D, accelerated back again as it returns from D to E, and retarded from E to B. This motion being therefore sent in succession through a range of elastic air, it must happen that the parts of one range of air must be sent forward with accelerated motion, and then with a retarded motion. This accelerated motion reaching the remotest end of the first range, will be communicated to a second range, while the nearest parts of the first range being retarded in their motion, and falling back with the recession of the string, retire first with an accelerated, then with a retarded motion, and the remotest parts will soon follow. In the mean time, while the parts of the first range are thus falling back, the parts of the second range are going forward with an accelerated motion. Thus there will be an alternate condensation and relaxation of the air during the time of one vibration; and as the air going forward strikes any opposing body with greater force than upon retiring, so each of these accelerated progressions have been called by Newton a *pulse* of sound.

Thus will the air be driven forward in the direction of the string. But now we must observe, that these pulses will move every way; for all motion impressed upon fluids in any direction whatsoever, operates all around in a sphere: so that sounds will be driven in all directions, backwards, forwards, upwards, downwards, and on every side. They will go on succeeding each other, one on the outside of the other, like circles in disturbed water; or rather, they will lie one without the other, in concentric shells, shell above shell, as we see in the coats of an onion.

All who have remarked the tone of a bell, while its sounds are decaying away, must have an idea of the pulses of sound, which, according to Newton, are formed by the air's alternate progression and recession. And it must be observed, that as each of these pulses is formed by a single vibration of the string, they must be equal to each other; for the vibrations of the string are known to be so.

Again, as to the velocity with which sounds travel, this Newton determines, by the most difficult calculation that can be imagined, to be in proportion to the thickness of the parts of the air, and the distance of these parts from each other. From hence he goes on to prove, that each little part moves backward and forward like a pendulum; and from thence he proceeds to demonstrate, that if the atmosphere were of the same

N^o 2.

density every where as at the surface of the earth, in such a case, a pendulum, that reached from its highest surface down to the surface of the earth, would by its vibrations discover to us the proportion of the velocity with which sounds travel. The velocity with which each pulse would move, he shows, would be as much greater than the velocity of such a pendulum swinging with one complete vibration, as the circumference of a circle is greater than the diameter. From hence he calculates, that the motion of sound will be 979 feet in one second. But this not being consonant to experience, he takes in another consideration, which destroys entirely the rigour of his former demonstration, namely, vapours in the air; and then finds the motion of sound to be 1142 feet in one second, or near 13 miles in a minute: a proportion which experience had established nearly before.

Thus much will serve to give an obscure idea of a theory which has met with numbers of opposers. Even John Bernouilli, Newton's greatest disciple, modestly owns that he did not pretend to understand this part of the *Principia*. He attempted therefore to give a more perspicuous demonstration of his own, that might confirm and illustrate the Newtonian theory. The subject seemed to reject elucidation: his theory is obviously wrong, as D'Alembert has proved in his *Theory of Fluids*.

Various have been the objections that have been made to the Newtonian system of sounds. It is urged, that this theory can only agree with the motion of sound in an elastic fluid, whereas sounds are known to move forward through water that is not elastic. To explain their progress therefore through water, a second theory must be formed: so that two theories must be made to explain a similar effect; which is contrary to the simplicity of true philosophy, for it is contrary to the simplicity of nature. It is further urged, that this slow vermicular motion but ill represents the velocity with which sounds travel, as we know by experience that it is almost 13 miles in a minute. In short, it is urged, that such undulations as have been described, when coming from several sonorous bodies at once, would cross, obstruct, and confound each other; so that, if they were conveyed to the ear by this means, we should hear nothing but a medley of discord and broken articulations. But this is equally with the rest contradictory to experience, since we hear the fullest concert, not only without confusion, but with the highest pleasure. These objections, whether well founded or not, have given rise to another theory: which we shall likewise lay before the reader; though it too appears liable to objections, which shall be afterwards mentioned.

Every sound may be considered as driven off from the sounding body in straight lines, and impressed upon the air in one direction only: but whatever impression is made upon a fluid in one direction, is diffused upon its surface into all directions; so that the sound first driven directly forward soon fills up a wide sphere, and is heard on every side. Thus, as it is impressed, it instantaneously travels forward with a very swift motion, resembling the velocity with which we know electricity flies from one end of a line to another.

Now, as to the pulses, or close shakes as the musicians express it, which a sounding body is known to make,

Different
Theories of
Sound.

7
Preceding
theory op-
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Another
theory.

Different Theories of Sound.

Different Theories of Sound.

make, each pulse (say the supporters of this theory) is itself a distinct and perfect sound, and the interval between every two pulses is profoundly silent. Continuity of sound from the same body is only a deception of the hearing; for as each distinct sound succeeds at very small intervals, the organ has no time to transmit its images with equal swiftness to the mind, and the interval is thus lost to sense: just as in seeing a flaming torch, if flared round in a circle, it appears as a ring of fire. In this manner a beaten drum, at some small distance, presents us with the idea of continuing sound. When children run with their sticks along a rail, a continuing sound is thus represented, though it need scarce be observed that the stroke against each rail is perfectly distinct and insulated.

According to this theory, therefore, the pulses are nothing more than distinct sounds repeated by the same body, the first stroke or vibration being ever the loudest, and travelling farther than those that follow; while each succeeding vibration gives a new sound, but with diminished force, till at last the pulses decay away totally, as the force decays that gives them existence.

All bodies whatsoever that are struck return more or less a sound: but some, wanting elasticity, give back no repetition of the sound; the noise is at once begotten and dies: while other bodies, however, there are, which being more elastic and capable of vibration, give back a sound, and repeat the same several times successively. These last are said to have a tone; the others are not allowed to have any.

This tone of the elastic string, or bell, is notwithstanding nothing more than a similar sound of what the former bodies produced, but with the difference of being many times repeated while their notes is but single. So that, if we would give the former bodies a tone, it will be necessary to make them repeat their sound, by repeating our blows swiftly upon them. This will effectually give them a tone; and even an unmusical instrument has often had a fine effect by its tone in our concerts.

Let us now go on then to suppose, that by swift and equably continued strokes we give any non-elastic body its tone: it is very obvious, that no alterations will be made in this tone by the quickness of the strokes, though repeated ever so fast. These will only render the tone more equal and continuous, but make no alteration in the tone it gives. On the contrary, if we make an alteration in the force of each blow, a different tone will then undoubtedly be excited. The difference will be small, it must be confessed; for the tones of these inflexible bodies are capable but of small variation; however, there will certainly be a difference. The table on which we write, for instance, will return a different sound when struck with a club, from what it did when struck only with a switch. Thus non-elastic bodies return a difference of tone, not in proportion to the swiftness with which their sound is repeated, but in proportion to the greatness of the blow which produced it; for in two equal non-elastic bodies, that body produced the deepest tone which was struck by the greatest blow.

We now then come to a critical question, What is it that produces the difference of tone in two elastic sounding bells or strings? Or what makes one deep and the other shrill? This question has always been hitherto

VOL. I. Part I.

answered by saying, that the depth or height of the note proceeded from the slowness or swiftness of the times of the vibrations. The slowest vibrations, it has been said, are qualified for producing the deepest tones, while the swiftest vibrations produce the highest tones. In this case, an effect has been given for a cause. It is in fact the force with which the sounding string strikes the air when struck upon, that makes the true distinction in the tones of sounds. It is this force, with greater or less impressions, resembling the greater or less force of the blows upon a non-elastic body, which produces correspondent affections of sound. The greatest forces produce the deepest sounds: the high notes are the effect of small efforts. In the same manner a bell, wide at the mouth, gives a grave sound; but if it be very massy withal, that will render it still graver; but if massy, wide, and long or high, that will make the tone deepest of all.

Thus, then, will elastic bodies give the deepest sound, in proportion to the force with which they strike the air: but if we should attempt to increase their force by giving them a stronger blow, this will be in vain; they will still return the same tone; for such is their formation, that they are sonorous only because they are elastic, and the force of this elasticity is not increased by our strength, as the greatness of a pendulum's vibration will not be increased by falling from a greater height.

Thus far of the length of chords. Now as to the frequency with which they vibrate the deepest tones, it has been found, from the nature of elastic strings, that the longest strings have the widest vibrations, and consequently go backward and forward slowest; while, on the contrary, the shortest strings vibrate the quickest, or come and go in the shortest intervals. From hence those who have treated of sounds, have asserted, as was said before, that the tone of the string depended upon the length or the shortness of the vibrations. This, however, is not the case. One and the same string, when struck, must always, like the same pendulum, return precisely similar vibrations; but it is well known, that one and the same string, when struck upon, does not always return precisely the same tone: so that in this case the vibrations follow one rule, and the tone another. The vibrations must be invariably the same in the same string, which does not return the same tone invariably, as is well known to musicians in general. In the violin, for instance, they can easily alter the tone of the string an octave or eight notes higher, by a softer method of drawing the bow; and some are known thus to bring out the most charming airs imaginable. These peculiar tones are by the English fiddlers called *flute-notes*. The only reason, it has been alleged, that can be assigned for the same string thus returning different tones, must certainly be the different force of its strokes upon the air. In one case, it has double the tone of the other; because upon the soft touches of the bow, only half its elasticity is put into vibration.

This being understood (continue the authors of this theory), we shall be able clearly to account for many things relating to sounds that have hitherto been inexplicable. Thus, for instance, if it be asked, When two strings are stretched together of equal lengths, tensions, and thickness, how does it happen, that one of them being struck, and made to vibrate

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Different
Theories of
Sound.

throughout, the other shall vibrate throughout also? the answer is obvious: The force that the string struck receives is communicated to the air, and the air communicates the same to the similar string; which therefore receives all the force of the former; and the force being equal, the vibrations must be so too. Again, put the question, If one string be but half the length of the other, and be struck, how will the vibrations be? The answer is, The longest string will receive all the force of the string half as long as itself, and therefore it will vibrate in proportion, that is, through half its length. In the same manner, if the longest string were three times as long as the other, it would only vibrate in a third of its length; or if four times, in a fourth of its length. In short, whatever force the smaller string impresses upon the air, the air will impress a similar force upon the longer string, and partially excite its vibrations.

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Eolian Lyre
See Plate I.
fig. 2.

* Vide Kir-
cheri Mu-
surgia, lib.
ix.

From hence also we may account for the cause of those charming, melancholy gradations of sound in the Eolian lyre; an instrument (says Sir John Hawkins) lately obtruded upon the public as a new invention, though described above a century ago by Kircher*. This instrument is easily made, being nothing more than a long narrow box of thin dale, about 30 inches long, 5 inches broad, and $1\frac{3}{4}$ inches deep, with a circle in the middle of the upper side or belly about $1\frac{1}{2}$ inch diameter, pierced with small holes. On this side are seven, ten, or (according to Kircher) fifteen or more strings of very fine gut, stretched over bridges at each end, like the bridge of a fiddle, and screwed up or relaxed with screw-pins (B). The strings are all tuned to one and the same note; and the instrument is placed in some current of air, where the wind can brush over its strings with freedom. A window with the sash just raised to give the air admission, will answer this purpose exactly. Now when the entering air blows upon these strings with different degrees of force, there will be excited different tones of sound; sometimes the blast brings out all the tones in full concert; sometimes it sinks them to the softest murmurs; it feels for every tone, and by its gradations of strength solicits those gradations of sound which art has taken different methods to produce.

It remains, in the last place, to consider (by this theory) the loudness and lowness, or, as the musicians speak, the strength and softness of sound. In vibrating elastic strings, the loudness of the tone is in proportion to the deepness of the note; that is, in two strings, all things in other circumstances alike, the deepest tone will be loudest. In musical instruments upon a different principle, as in the violin, it is otherwise; the tones are made in such instruments, by a number of small vibrations crowded into one stroke. The refined bow, for instance, being drawn along a string, its roughnesses catch the string at very small intervals, and excite its vibrations. In this instrument, therefore, to excite loud tones, the bow must be drawn quick, and this will produce the greatest number of vibrations. But it must be observed, that the more quick the bow passes over the string, the less apt will

the roughness of its surface be to touch the string at every instant; to remedy this, therefore, the bow must be pressed the harder as it is drawn quicker, and thus its fullest sound will be brought from the instrument. If the swiftness of the vibrations in an instrument thus rubbed upon, exceed the force of the deeper sound in another, then the swift vibrations will be heard at a greater distance, and as much farther off as the swiftness in them exceeds the force in the other.

By the same theory (it is alleged) may all the phenomena of musical sounds be easily explained.—The fables of the ancients pretend, that music was first found out by the beating of different hammers upon the smith's anvil. Without pursuing the fable, let us endeavour to explain the nature of musical sounds by a similar method. Let us suppose an anvil, or several similar anvils, to be struck upon by several hammers of different weights or forces. The hammer, which is double that of another, upon striking the anvil will produce a sound double that of the other: this double sound musicians have agreed to call an Octave. The ear can judge of the difference or resemblance of these sounds with great ease, the numbers being as one and two, and therefore very readily compared. Suppose that an hammer, three times less than the first, strikes the anvil, the sound produced by this will be three times less than the first: so that the ear, in judging the similitude of these sounds, will find somewhat more difficulty; because it is not so easy to tell how often one is contained in three, as it is to tell how often it is contained in two. Again, suppose that an hammer four times less than the first strikes the anvil, the ear will find greater difficulty still in judging precisely the difference of the sounds; for the difference of the numbers four and one cannot so soon be determined with precision as three and one. If the hammer be five times less, the difficulty of judging will be still greater. If the hammer be six times less, the difficulty still increases, and so also of the seventh, insomuch that the ear cannot always readily and at once determine the precise gradation. Now, of all comparisons, those which the mind makes most easily, and with least labour, are the most pleasing. There is a certain regularity in the human soul, by which it finds happiness in exact and striking, and easily-made comparisons. As the ear is but an instrument of the mind, it is therefore most pleased with the combination of any two sounds, the differences of which it can most readily distinguish. It is more pleased with the concord of two sounds which are to each other as one and two, than of two sounds which are as one and three, or one and four, or one and five, or one and six or seven. Upon this pleasure, which the mind takes in comparison, all harmony depends. The variety of sounds is infinite; but because the ear cannot compare two sounds so as readily to distinguish their discriminations when they exceed the proportion of one and seven, musicians have been content to confine all harmony within that compass, and allowed but seven notes in musical composition.

Let us now then suppose a stringed instrument fitted up

(B) The figure represents the instrument with ten chords: of which some direct only eight to be tuned unisons, and the two outermost octaves below them. But this seems not material.

Ch. I.

Of Musical
Sounds.

up in the order mentioned above. For instance: Let the first string be twice as long as the second; let the third string be three times shorter than the first; let the fourth be four times, the fifth string five times, and the sixth six times as short as the first. Such an instrument would probably give us a representation of the lyre as it came first from the hand of the inventor. This instrument will give us all the seven notes following each other, in the order in which any two of them will accord together most pleasingly; but yet it will be a very inconvenient and a very disagreeable instrument: inconvenient, for in a compass of seven strings only, the first must be seven times as long as the last; and disagreeable, because this first string will be seven times as loud also; so that when the tones are to be played in a different order, loud and soft sounds would be intermixed with most disgusting alternations. In order to improve the first instrument, therefore; succeeding musicians very judiciously threw in all the other strings between the two first, or, in other words, between the two octaves, giving to each, however, the same proportion to what it would have had in the first natural instrument. This made the instrument more portable, and the sounds more even and pleasing. They therefore disposed the sounds between the octave in their natural order, and gave each its own proportional dimensions. Of these sounds, where the proportion between any two of them is most obvious, the concord between them will be most pleasing. Thus octaves, which are as two to one, have a most harmonious effect; the fourth and fifth also sound sweetly together, and they will be found, upon calculation, to bear the same proportion to each other that octaves do. "Let it not be supposed (says Mr Sauveur), that the musical scale is merely an arbitrary combination of sounds; it is made up from the consonance and differences of the parts which compose it. Those who have often heard a fourth and fifth accord together, will be naturally led to discover their difference at once; and the mind unites itself to their beauties." Let us then cease to assign the coincidences of vibrations as the cause of harmony, since these coincidences in two strings vibrating at different intervals, must at best be but fortuitous; whereas concord is always pleasing. The true cause why concord is pleasing, must arise from our power in such a case, of measuring more easily the differences of the tones. In proportion as the note can be measured with its fundamental tone by large and obvious distinctions, then the concord is most pleasing; on the contrary, when the ear measures the discriminations of two tones by very small parts, or cannot measure them at all, it loses the beauty of their resemblance: the whole is discord and pain (c).

But there is another property in the vibration of a musical string not yet taken notice of, and which is alleged to confirm the foregoing theory. If we strike the string of an harpsichord, or any other elastic sounding chord whatever, it returns a continuing sound. This till of late was considered as one simple uniform tone; but all

musicians now confess, that instead of one tone it actually returns four tones, and that constantly. The notes are, beside the fundamental tone, an octave above, a twelfth above, and a seventeenth. One of the bass-notes of an harpsichord has been dissected in this manner by Rameau, and the actual existence of these tones proved beyond a possibility of being controverted. In fact, the experiment is easily tried; for if we smartly strike one of the lower keys of an harpsichord, and then take the finger briskly away, a tolerable ear will be able to distinguish, that, after the fundamental tone has ceased, three other shriller tones will be distinctly heard; first the octave above, then the twelfth, and lastly the seventeenth: the octave above is in general almost mixed with the fundamental tone, so as not to be easily perceived, except to an ear long habituated to the minute discriminations of sounds. So that we may observe, that the smallest tone is heard last, and the deepest and largest one first: the two others in order.

In the whole theory of sounds, nothing has given greater room for speculation, conjecture, and disappointment, than this amazing property in elastic strings. The whole string is universally acknowledged to be in vibration in all its parts, yet this single vibration returns no less than four different sounds. They who account for the tones of strings by the number of their vibrations, are here at the greatest loss. Daniel Bernouilli supposes, that a vibrating string divides itself into a number of curves, each of which has a peculiar vibration; and though they all swing together in the common vibration, yet each vibrates within itself. This opinion, which was supported, as most geometrical speculations are, with the parade of demonstration, was only born soon after to die. Others have ascribed this to an elastic difference in the parts of the air, each of which, at different intervals, thus received different impressions from the string, in proportion to their elasticity. This is absurd. If we allow the difference of tone to proceed from the force, and not the frequency, of the vibrations, this difficulty will admit of an easy solution. These sounds, though they seem to exist together in the string, actually follow each other in succession: while the vibration has greatest force, the fundamental tone is brought forward: the force of the vibration decaying, the octave is produced, but almost only instantaneously; to this succeeds, with diminished force, the twelfth; and, lastly, the seventeenth is heard to vibrate with great distinctness, while the three other tones are always silent. These sounds, thus excited, are all of them the harmonic tones, whose differences from the fundamental tone are, as was said, strong and distinct. On the other hand, the discordant tones cannot be heard. Their differences being but very small, they are overpowered, and in a manner drowned in the tones of superior difference: yet not always neither; for Daniel Bernouilli has been able, from the same stroke, to make the same string bring out its harmonic and its discordant tones also (d). So that from hence we may justly infer, that every note whatsoever

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is

(c) It is certain, that in proportion to the simplicity of relations in sound, the ear is pleased with its combinations; but this is not to be admitted, as the cause why musicians have confined all harmony to an octave. Discriminated sounds, whose vibrations either never coincide, or at least very rarely, do not only cease to please, but violently grate, the ear. Harmony and discord, therefore, are neither discriminated by the judgment of hearers, nor the institution of musicians, but by their own essential and immutable nature.

(d) Vid. Memoires de l'Academie de Berlin, 1753, p. 153.

Of Musical Sounds. is only a succession of tones; and that those are most distinctly heard, whose differences are most easily perceivable.

¹² Objections to the preceding theory. To this theory, however, though it has a plausible appearance, there are strong and indeed insuperable objections. The very fundamental principle of it is false. No body whatever, whether elastic or non-elastic, yields a graver sound by being struck with a larger instrument, unless either the sounding body, or that part of it which emits the sound, is enlarged. In this case, the largest bodies always return the gravest sounds.

In speaking of elastic and non-elastic bodies in a musical sense, we are not to push the distinction so far as when we speak of them philosophically. A body is *musically* elastic, all of whose parts are thrown into vibrations so as to emit a sound when only part of their surface is struck. Of this kind are bells, musical strings, and all bodies whatever that are considerably hollow.—Musical non-elastics are such bodies as emit a sound only from that particular place which is struck: thus, a table, a plate of iron nailed on wood, a bell sunk in the earth, are all of them non-elastics in a musical sense, though not philosophically so. When a solid body, such as a log of wood, is struck with a switch, only that part of it emits a sound which comes in contact with the switch; the note is acute and loud, but would be no less so though the adjacent parts of the log were removed. If, instead of the switch, a heavier or larger instrument is made use of, a larger portion of its surface then returns a sound, and the note is consequently more grave; but it would not be so, if the large instrument struck with a sharp edge, or a surface only equal to that of the small one.

In sounds of this kind, where there is only a single thwack, without any repetition, the immediate cause of the gravity or acuteness seems to be the quantity of air displaced by the sounding body; a large quantity of air displaced, produces a grave sound, and a smaller quantity a more acute one, the force wherewith the air is displaced signifying very little.—What we hear advance is confirmed by some experiments made by Dr Priestley, concerning the *musical tone* of electrical discharges. The passage being curious, and not very long, we shall here transcribe it:

“As the course of my experiments has required a great variety of electrical explosions, I could not help observing a great variety in the musical tone made by the reports. This excited my curiosity to attempt to reduce this variation to some measure. Accordingly, by the help of a couple of spinets, and two persons who had good ears for music, I endeavoured to ascertain the tone of some electrical discharges; and observed, that every discharge made several strings, particularly those that were chords to one another, to vibrate: but one note was always predominant, and sounded after the rest. As every explosion was repeated several times, and three of us separately took the same note, there remained no doubt but that the tone we fixed upon was at least very near the true one. The result was as follows:

“A jar containing half a square foot of coated glass sounded F sharp, concert pitch. Another jar of a different form, but equal surface, sounded the same.

“A jar of three square feet sounded C below F

sharp. A battery consisting of sixty-four jars, each containing half a square foot, sounded F below the C.

“The same battery, in conjunction with another of thirty-one jars, sounded C sharp. So that a greater quantity of coated glass always gave a deeper note.

“Differences in the degree of a charge in the same jar made little or no difference in the tone of the explosion; if any, a higher charge gave rather a deeper note.”

These experiments show us how much the gravity or acuteness of sounds depend on the quantity of air put in agitation by the sounding body. We know that the noise of the electric explosion arises from the return of the air into the vacuum produced by the electric flash. The larger the vacuum, the deeper was the note: for the same reason, the discharge of a musket produces a more acute note than that of a cannon; and thunder is deeper than either.

Besides this, however, other circumstances concur to produce different degrees of gravity or acuteness in sounds. The sound of a table struck upon with a piece of wood, will not be the same with that produced from a plate of iron struck by the same piece of wood, even if the blows should be exactly equal, and the iron perfectly kept from vibrating.—Here the sounds are generally said to differ in their degrees of acuteness, according to the specific gravities or densities of the substances which emit them. Thus gold, which is the most dense of all metals, returns a much graver sound than silver; and metalline wires, which are more dense than therms, return a proportionably graver sound.—But neither does this appear to be a general rule in which we can put confidence. Bell-metal is denser than copper, but it by no means appears to yield a graver sound; on the contrary, it seems very probable, that copper will give a graver sound than bell-metal, if both are struck upon in their non-elastic state; and we can by no means think that a bell of pure tin, the least dense of all the metals, will give a more acute sound than one of bell metal, which is greatly more dense.—In some bodies hardness seems to have a considerable effect. Glass, which is considerably harder than any metal, gives a more acute sound; bell-metal is harder than gold, lead, or tin, and therefore sounds much more acutely; though how far this holds with regard to different substances, there are not a sufficient number of experiments for us to judge.

In bodies musically elastic, the whole substance vibrates with the slightest stroke, and therefore they always give the same note whether they are struck with a large or with a small instrument; so that striking a part of the surface of any body musically elastic is equivalent, in it, to striking the whole surface of a non-elastic one. If the whole surface of a table was struck with another table, the note produced would be neither more nor less acute whatever force was employed; because the whole surface would then yield a sound, and no force could increase the surface: the sound would indeed be louder in proportion to the force employed, but the gravity would remain the same. In like manner, when a bell, or musical string, is struck, the whole substance vibrates, and a greater stroke cannot increase the substance.—Hence we see the fallacy of what is said concerning the Pythagorean anvils. An anvil is a body musically elastic, and no difference in the tone can

Of Musical Sounds

can be perceived whether it is struck with a large or with a small hammer; because either of them are sufficient to make the whole substance vibrate, provided nothing but the anvil is struck upon: smiths, however, do not strike their anvils, but red-hot iron laid upon their anvils; and thus the vibrations of the anvil are stopped, so that it becomes a non-elastic body, and the differences of tone in the strokes of different hammers proceed only from the surface of the large hammers covering the whole surface of the iron, or at least a greater part of it than the small ones. If the small hammer is sufficient to cover the whole surface of the iron as well as the large one, the note produced will be the same, whether the large or the small hammer is used.

Lastly, The argument for the preceding theory, grounded on the production of what are called *flute-notes* on the violin, is built on a false foundation; for the bow being lightly drawn on an open string, produces no *flute-notes*, but only the harmonies of the note to which the string is tuned. The *flute-notes* are produced by a particular motion of the bow, quick and near the bridge, and by fingering very gently. By this management, the same sounds are produced, tho' at certain intervals only, as if the vibrations were transferred to the space between the end of the finger-board and the finger, instead of that between the finger and the bridge. Why this small part of the string should vibrate in such a case, and not that which is under the immediate action of the bow, we must own ourselves ignorant: nor dare we affirm that the vibrations really are transferred in this manner, only the same sounds are produced as if they were.

Though these objections seem sufficiently to overturn the foregoing theory, with regard to acute sounds being the effects of weak strokes, and graves ones of stronger impulses, we cannot admit that longer or shorter vibrations are the occasion of gravity or acuteness in sound. A musical sound, however lengthened, either by string or bell, is only a repetition of a single one, whose duration by itself is but for a moment, and is therefore termed *inappretiable*, like the smack of a whip, or the explosion of an electrical battery. The continuation of the sound is nothing more than a repetition of this instantaneous inappretiable noise after the manner of an echo, and it is only this echo that makes the sound agreeable. For this reason, music is much more agreeable when played in a large hall where the sound is reverberated, than in a small room where there is no such reverberation. For the same reason, the sound of a string is more agreeable when put on a hollow violin than when fastened to a plain board, &c.—In the sound of a bell we cannot avoid observing this echo very distinctly. The sound appears to be made up of distinct pulses, or repetitions of the same note produced by the stroke of the hammer. It can by no means be allowed, that the note would be more acute though these pulses were to succeed one another more rapidly; the sound would indeed become more simple, but would still preserve the same tone.—In musical strings the reverberations are vastly more quick than in bells; and therefore their sound is more uniform or simple, and consequently more agreeable than that of bells. In musical glasses*, the vibrations must be inconceivably quicker than in any bell or stringed instrument: and hence they are of all others

the most simple and the most agreeable, though neither the most acute nor the loudest.—As far as we can judge, quickness of vibration contributes to the uniformity, or simplicity, but not to the acuteness, nor to the loudness, of a musical note.

It may here be objected, that each of the different pulses, of which we observe the sound of a bell to be composed, is of a very perceptible length, and far from being instantaneous; so that it is not fair to infer that the sound of a bell is only a repetition of a single instantaneous stroke, seeing it is evidently the repetition of a lengthened note.—To this it may be replied, that the inappretiable sound which is produced by striking a bell in a non-elastic state, is the very same which, being first propagated round the bell, forms one of these short pulses that is afterwards re-echoed as long as the vibrations of the metal continue, and it is impossible that the quickness of repetition of any sound can either increase or diminish its gravity.

CHAP. II. Of the propagation of Sound. Newton's Doctrine explained and vindicated.

THE writers on sound have been betrayed into these difficulties and obscurities, by rejecting the 47th proposition, B. ii. of Newton, as inconclusive reasoning. Of this proposition, however, the ingenious Mr Young of Trinity college, Dublin, has lately given a clear, explanatory, and able defence. He candidly owns that the demonstration is obscurely stated, and takes the liberty of varying, in some degree, from the method of Newton.

"1. The parts of all sounding bodies (he observes), vibrate according to the law of a cycloidal pendulum: for they may be considered as composed of an indefinite number of elastic fibres; but these fibres vibrate according to that law. *Vide Hefham, p. 270.*

"2. Sounding bodies propagate their motions on all sides *in directum*, by successive condensations and rarefactions, and successive goings forward and returnings backward of the particles. *Vide prop. 43. B. 2. Newton.*

"3. The pulses are those parts of the air which vibrate backwards and forwards; and which, by going forward, strike (*pulsant*) against obstacles. The latitude of a pulse is the rectilineal space through which the motion of the air is propagated during one vibration of the sounding body.

"4. All pulses move equally fast. This is proved by experiment; and it is found that they describe 1070 Paris feet, or 1142 London feet in a second, whether the sound be loud or low, grave or acute.

"5. Prob. To determine the latitude of a pulse. Divide the space which the pulse describes in a given time (4) by the number of vibrations performed in the same time by the sounding body, (*cor. 1. prop. 24. Smith's Harmonics*), the quotient is the latitude.

"M. Sauveur, by some experiments on organ-pipes, found that a body, which gives the gravest harmonic sound, vibrates 12 times and an half in a second, and that the shrillest sounding body vibrates 51,100 times in a second. At a medium, let us take the body which gives what Sauveur calls his *fixed sound*: it performs 100 vibrations in a second, and in the same time the pulses describe 1070 Parisian feet; therefore the space described by the pulses whilst the body vibrates once, that

* See *Harmonica*.

Propaga-
tion of
Sound.

that is, the latitude, or interval of the pulse, will be 10.7 feet.

" 6. Prob. To find the proportion which the greatest space, through which the particles of the air vibrate, bears to the radius of a circle, whose perimeter is equal to the latitude of the pulse.

" During the first half of the progress of the elastic fibre, or sounding body, it is continually getting nearer to the next particle; and during the latter half of its progress, that particle is getting farther from the fibre, and these portions of time are equal (*Helsham*): therefore we may conclude, that at the end of the progress of the fibre, the first particle of air will be nearly as far distant from the fibre as when it began to move; and in the same manner we may infer, that all the particles vibrate through spaces nearly equal to that run over by the fibre.

" Now M. Sauveur (*Acad. Science, an. 1700, p. 141.*) has found by experiment, that the middle point of a chord which produces his *fixed sound*, and whose diameter is $\frac{1}{8}$ th of a line, runs over in its smallest sensible vibrations $\frac{1}{8}$ th of a line, and in its greatest vibrations 72 times that space; that is $72 \times \frac{1}{8}$ th of a line, or 4 lines, that is $\frac{1}{4}$ d of an inch.

" The latitude of the pulses of this fixed sound is 10.7 feet (5); and since the circumference of a circle is to its radius as 710 is to 113, the greatest space described by the particles will be to the radius of a circle, whose periphery is equal to the latitude of the pulse as $\frac{1}{4}$ d of an inch is to 1.7029 feet, or 20.4348 inches, that is, as 1 to 61.3044.

" If the length of the string be increased or diminished in any proportion, *ceteris paribus*, the greatest space described by its middle point will vary in the same proportion. For the inflecting force is to the tending force as the distance of the string from the middle point of vibration to half the length of the string (*see Helsham and Martin*); and therefore the inflecting and tending forces being given, the string will vibrate through spaces proportional to its length; but the latitude of the pulse is inversely as the number of vibrations performed by the string in a given time, (5.) that is, directly as the time of one vibration, or directly as the length of the string (*prop. 24. cor. 7. Smith's Harmonics*); therefore the greatest space through which the middle point of the string vibrates will vary in the direct ratio of the latitude of the pulse, or of the radius of a circle whose circumference is equal to the latitude, that is, it will be to that radius as 1 to 61.3044.

" 7. If the particles of the aerial pulses, during any part of their vibration, be successively agitated, according to the law of a cycloidal pendulum, the comparative elastic forces arising from their mutual action, by which they will afterwards be agitated, will be such as will cause the particles to continue that motion, according to the same law, to the end of their vibration.

Plate I.
fig. 7.

" Let AB, BC, CD, &c. denote the equal distances of the successive pulses; ABC the direction of the motion of the pulses propagated from A towards B; E, F, G, three physical points of the quiescent medium, situated in the right line AC at equal distances from each other; Ee, Ff, Gg, the very small equal spaces through which these particles vibrate; e, f, g, any intermediate places of these points.

Propaga-
tion of
Sound.

Draw the right line PS equal to Ee, bisect it in O, and from the centre O with the radius OP describe the circle SIPb. Let the whole time of the vibration of a particle and its parts be denoted by the circumference of this circle and its proportional parts. And since the particles are supposed to be at first agitated according to the law of a cycloidal pendulum, if at any time PH or PHSb, the perpendicular HL or bl, be let fall on PS, and if Ee be taken equal to PL or Pl, the particle E shall be found in e. Thus will the particle E perform its vibrations according to the law of a cycloidal pendulum. *Prop. 52. B. 1. Principia.*

" Let us suppose now, that the particles have been successively agitated, according to this law, for a certain time, by any cause whatsoever, and let us examine what will be the comparative elastic forces arising from their mutual action, by which they will afterwards continue to be agitated.

" In the circumference PHSb take the equal arches HI, IK in the same ratio to the whole circumference which the equal right lines EF, FG have to BC the whole interval of the pulses; and let fall the perpendiculars HL, IM, KN. Since the points E, F, G are successively agitated in the same manner, and perform their entire vibrations of progress and regress while the pulse is propagated from B to C, if PH be the time from the beginning of the motion of E, PI will be the time from the beginning of the motion of F, and PK the time from the beginning of the motion of G; and therefore Ee, Ff, Gg will be respectively equal to PL, PM, PN in the progress of the particles. Whence e or $EF + Ff - Ee$ is equal to $EF - LM$. But e is the expansion of EF in the place e , and therefore this expansion is to its mean expansion as $EF - LM$ to EF. But LM is to IH as IM is to OP, and IH is to EF as the circumference PHSb is to BC; that is, as OP is to V, if V be the radius of a circle whose circumference is BC; therefore, *ex aequo*, LM is to EF as IM is to V; and therefore the expansion of EF in the place e is to its mean expansion as $V - IM$ is to V; and the elastic force existing between the physical points E and F is to the mean elastic force as

$\frac{1}{V - IM}$ is to $\frac{1}{V}$ (*Cotes Pneum. Lect. 9.*) By the same argument, the elastic force existing between the physical points F and G is to the mean elastic force as $\frac{1}{V - KN}$ is to $\frac{1}{V}$; and the difference between these forces is to the mean elastic force as

$\frac{IM - KN}{V^2 - V \cdot IM - V \cdot KN + IM \cdot KN}$ is to $\frac{1}{V}$; that is, as $\frac{IM - KN}{V^2}$ is to $\frac{1}{V}$; or as $IM - KN$ is to V; if only

(upon account of the very narrow limits of the vibration) we suppose IM and KN to be indefinitely less than V. Wherefore, since V is given, the difference of the forces is as $IM - KN$, or as $HL - IM$ (because KH is bisected in I); that is, (because HL - IM is to IH as OM is to OI or OP, and IH and OP are given quantities) as OM; that is, if Ff be bisected in Ω as Ωe .

" In the same manner it may be shown, that if PHSb be the time from the beginning of the motion of E, PHSi will be the time from the beginning of the motion of F, and PHSk the time from the beginning of the motion of G.

Propaga-
tion of
Sound.

the motion of G; and that the expansion of EF in the place ϕ is to its mean expansion as $EF + F\phi - E\phi$, or as $EF + \frac{1}{2}m$ is to EF, or as $V + \frac{1}{2}h$ is to V in its regrefs; and its elastic force to the mean elastic force as

$\frac{1}{V + \frac{1}{2}h}$ is to $\frac{1}{V}$; and that the difference of the elastic forces existing between E and F, and between F and G is to the mean elastic force as $kn - im$ is to V; that is, directly as $\Omega\phi$.

"But this difference of the elastic forces, existing between E and F, and between F and G, is the comparative elastic force by which the physical point ϕ is agitated: and therefore the comparative accelerating force, by which every physical point in the medium will continue to be agitated both in progress and regrefs, will be directly as its distance from the middle point of its vibration; and consequently will be such as will cause the particles to continue their motion undisturbed, according to the law of a cycloidal pendulum. Prop. 38. l. 1. Newton.

"Newton rejects the quantity $+V \times IM + KN + IM \times KN$, on supposition that IM and KN are indefinitely less than V. Now, although this may be a reasonable hypothesis, yet, that this quantity may be safely rejected, will, I think, appear in a more satisfactory manner from the following considerations derived from experiment: PS, in its greatest possible state, is to V as 1 is to 61.3044 (6); and therefore IM, or KN, in its greatest possible state, (that is, when the vibrations of the body are as great as possible, and the particle in the middle point of its vibration) is to V as 1 is to 122.6. Hence $V^2 = 15030.76$, $-V \times IM + KN = 245.2$ and $IM \times KN = 1$; therefore V^2 is to $V^2 - V \times IM + KN + IM \times KN$ as 15.03076 is to 14786.56; that is as 61 is to 60 nearly.

"Hence it appears, that the greatest possible error in the accelerating force, in the middle point, is the $\frac{1}{61}$ th part of the whole. In other points it is much less; and in the extreme points the error entirely vanishes.

"We should also observe, that the ordinary sounds we hear are not produced by the greatest possible vibrations of which the sounding body is capable; and that in general IM and KN are nearly evanescent with respect to V. And very probably the disagreeable sensations we feel in very loud sounds, arise not only from IM or KN bearing a sensible proportion to V, by which means the cycloidal law of the pulses may be in some measure disturbed, but also from the very law of the motion of the sounding body itself being disturbed. For the proof of this law's being observed by an elastic fibre is founded on the hypothesis that the space, thro' which it vibrates, is indefinitely little with respect to the length of the string. See Smith's Harmonics, p. 237. Helsham, p. 270.

"8. If a particle of the medium be agitated according to the law of a cycloidal pendulum, the comparative elastic force, acting on the adjacent particle, from the instant in which it begins to move, will be such as will cause it to continue its motion according to the same law.

"For let us suppose, that three particles of the medium had continued to move for times denoted by the arches PK, PI, PH, the comparative elastic force,

acting on the second during the time of its motion, would have been denoted by HL—IN, that is, would have been directly as MO (7). And if this time be diminished till I becomes coincident with P, that is, if you take the particles in that state when the second is just beginning to move, and before the third particle has yet been set in motion; then the point M will fall on P, and MO become PO; that is, the comparative elastic force of the second particle, at the instant in which it begins to move, will be to the force with which it is agitated in any other moment of time, before the subsequent particle has yet been set in motion, directly as its distance from the middle point of vibration. Now this comparative elastic force, with which the second particle is agitated in the very moment in which it begins to move, arises from the preceding particle's approaching it according to the law of a pendulum; and therefore, if the preceding particle approaches it in this manner, the force by which it will be agitated, in the very moment it begins to move, will be exactly such as should take place in order to move it according to the law of a pendulum. It therefore sets out according to that law, and consequently the subsequent elastic forces, generated in every successive moment, will also continue to be of the just magnitude which should take place, in order to produce such a motion.

"9. The pulses of the air are propagated from sounding bodies, according to the law of a cycloidal pendulum. The point E of any elastic fibre producing a sound, may be considered as a particle of air vibrating according to the law of a pendulum (1). This point E will therefore move according to this law for a certain time, denoted by the arch IH, before the second particle begins to move; for sound is propagated in time through the successive particles of air (4). Now from that instant, the comparative elastic force which agitates F, is (8) directly as its distance from the middle point of vibration. F therefore sets out with a motion according to the law of a pendulum; and therefore the comparative elastic force by which it will be agitated until G begins to move, will continue that law (8). Consequently F will approach G in the same manner as E approached F, and the comparative elastic force of G, from the instant in which it begins to move, will be directly as its distance from the middle point of vibration; and so on in succession. Therefore all the particles of air in the pulses successively set out from their proper places according to the law of a pendulum, and therefore (7) will finish their entire vibrations according to the same law. Plate I. fig. 7.

Cor. 1. The number of pulses propagated is the same with the number of vibrations of the tremulous body, nor is it multiplied in their progress: because the little physical line γ , (fig. 7.) as soon as it returns to its proper place, will there quiesce; for its velocity, which is denoted by the sine IM, then vanishes, and its density becomes the same with that of the ambient medium. This line, therefore, will no longer move, unless it be again driven forwards by the impulse of the sounding body, or of the pulses propagated from it.

Cor. 2. In the extreme points of the little space through which the particle vibrates, the expansion of the air is in its natural state; for the expansion of the physical line is to its natural expansion as $V + IM$ is to

Propaga-
tion of
Sound.

to V; but IM is then equal to nothing. In the middle point of the progress the condensation is greatest; for IM is then greatest, and consequently the expansion V—IM least. In the middle of the regress, the rarefaction is greatest; for *im*, and consequently V+*im*, is then greatest.

“ 10. To find the velocity of the pulses, the density and elastic force of the medium being given.

“ This is the 49th prop. B. 2. Newton, in which he shows, that whilst a pendulum, whose length is equal to the height of the homogeneous atmosphere, vibrates once forwards and backwards, the pulses will describe a space equal to the periphery of a circle described with that altitude as its radius.

“ Cor. 1. He thence shows, that the velocity of the pulses is equal to that which a heavy body would acquire in falling down half the altitude of that homogeneous atmosphere; and therefore, that all pulses move equally fast, whatever be the magnitude of PS, or the time of its being described; that is, whether the tone be loud or low, grave or acute. See *Hales de Sonis*, § 49.

“ Cor. 2. And also, that the velocity of the pulses is in a ratio compounded of the direct subduplicate ratio of the elastic force of the medium, and the inverse subduplicate of its density. Hence sounds move somewhat faster in summer than in winter. See *Hales de Sonis*, p. 141.

“ 11. The strength of a tone is as the moment of the particles of air. The moment of these particles (the medium being given) is as their velocity; and the velocity of these particles is as the velocity of the string which sets them in motion (9). The velocities of two different strings are equal when the spaces which they describe in their vibrations are to each other as the times of these vibrations: therefore, two different tones are of equal strength, when the spaces, through which the strings producing them vibrate, are directly as the times of their vibration.

2d Plate II. “ 12. Let the strength of the tones of the two strings AB, CD, which differ in tension only (fig. 1, 2.) be equal. Quere the ratio of the inflecting forces F and f. From the hypothesis of the equality of the strength of the tones, it follows (11), that the space GE must be to the space HF as $f^{\frac{1}{2}}$ to $F^{\frac{1}{2}}$ (*Smith's Harm. Prop. 24. Cor. 4.*) Now the forces inflecting AB, CD, through the equal spaces GE, HP, are to each other as the tending forces, that is, as F to f (*Malcolm's Treatise on Music*, p. 52. But the force inflecting CD through HP is to the force inflecting it thro' HF as HP or GE to HF (*ib.* p. 47.), that is, by the hyp. as $f^{\frac{1}{2}}$ to $F^{\frac{1}{2}}$. Therefore, *ex æquo*, the forces inflecting AB and CD, when the tones are equally strong, are to each other as $F \times f^{\frac{1}{2}}$ to $f \times F^{\frac{1}{2}}$, or as $F^{\frac{1}{2}}$ to $f^{\frac{1}{2}}$. That is, the forces necessary to produce tones of equal strength in various strings which differ only in tension, are to each other in the subduplicate ratio of the tending forces, that is, inversely as the time of one vibration, or directly as the number of vibrations performed in a given time. Thus, if CD be the acute octave to AB, its tending force will be quadruple that of AB, (*Malcolm's Treatise on Music*, p. 53.); and therefore to produce tones of equal strength in these strings, the force impelling CD must be double that impelling AB; and so in other cases.

Nº 3.

“ Suppose, now, that the strings AB, CD (fig. 2, 3.), differ in length only. The force inflecting AB through GE is to the tending force, which is given, as GE to AG; and this tending force is to the force inflecting CD through the space HP equal to GE, as HD to HP. Therefore, *ex æquo*, the forces inflecting AB and CD through the equal spaces GE and HP, are to each other as HD to AG, or as CD to AB. But the force inflecting CD through HP is to the force inflecting it through HF, as HP or GE to HF, that is, because these spaces are as the times (11), as AB to CD. Therefore, *ex æquo*, the forces inflecting AB and CD, when the tones are equally strong, are to each other in a ratio of equality. Hence we should suppose, that in this case, an equal number of equal impulses would generate equally powerful tones in these strings. But we are to observe, that the longer the string, the greater, *ceteris paribus*, is the spaces through which a given force inflects it (*Malcolm*); and therefore whatever diminution is produced in the spaces through which the strings move in their successive vibrations, arising either from the want of perfect elasticity in the strings, or from the resistance of the air, this diminution will bear a greater proportion to the less space, through which the shorter string vibrates. And this is confirmed by experience; for we find that the duration of the tone and motion of the whole string exceeds that of any of its subordinate parts. Therefore, after a given interval of time, a greater quantity of motion will remain in the longer string; and consequently, after the successive equal impulses have been made, a greater degree of motion will still subsist in it. That is, a given number of equal impulses being made on various strings differing in length only, a stronger sound will be produced in that which is the longer.”

CHAP. III. Of the Velocity, &c. of Sound. Axioms.

EXPERIENCE has taught us, that sound travels at about the rate of 1142 feet in a second, or near 13 miles in a minute; nor do any obstacles hinder its progress, a contrary wind only a small matter diminishing its velocity. The method of calculating its progress is easily made known. When a gun is discharged at a distance, we see the fire long before we hear the sound. If then we know the distance of the place, and know the time of the interval between our first seeing the fire and then hearing the report, this will show us exactly the time the sound has been travelling to us. For instance, if the gun is discharged a mile off, the moment the flash is seen, you take a watch and count the seconds till you hear the sound; the number of seconds is the time the sound has been travelling a mile.—Again, by the above axiom, we are enabled to find the distance between objects that would be otherwise immeasurable. For example, suppose you see the flash of a gun in the night at sea, and tell seven seconds before you hear the report, it follows therefore, that the distance is seven times 1142 feet, that is, 24 yards more than a mile and a half. In like manner, if you observe the number of seconds between the lightning and the report of the thunder, you know the distance of the cloud from whence it proceeds.

Derham has proved by experience, that all sounds whatever travel at the same rate. The sound of a gun, the same and rate.

Propaga-
tion of
Sound.

2d Plate II.

14

Velocity of
a sound.

15

Its progress
calculated.

16

Distances
calculated
by means of
sound.

17

All sounds
travel at
the same
rate.

Reverberated
Sounds.

and the striking of a hammer, are equally swift in their motions; the softest whisper flies as swiftly, as far as it goes, as the loudest thunder.

To these axioms we may add the following.

18 Smooth and clear sounds proceed from bodies that are homogeneous, and of an uniform figure; and harsh or obtuse sounds, from such as are of a mixed matter and irregular figure.

19 The velocity of sound is to that of a brisk wind as fifty to one.

20 The strength of sounds is greatest in cold and dense air, and least in that which is warm and rarefied.

21 Every point against which the pulses of sound strike, becomes a centre from which a new series of pulses are propagated in every direction.

22 Sound describes equal spaces in equal times.

CHAP. IV. Of Reverberated Sounds.

23 SOUND, like light, after it has been reflected from several places, may be collected in one point, as into a focus; and it will be there more audible than in any other part, even than at the place from whence it proceeded. On this principle it is that a whispering gallery is constructed.

24 The form of this gallery must be that of a concave hemisphere (E), as ABC; and if a low sound or whisper be uttered at A, the vibrations expanding themselves every way will impinge on the points DDD, &c. and from thence be reflected to EEE, and from thence to the points F and G, till at last they all meet in C, where, as we have said, the sound will be the most distinctly heard.

25 THE augmentation of sound by means of speaking-trumpets, is usually illustrated in the following manner: Let ABC be the tube, BD the axis, and B the mouth-piece for conveying the voice to the tube. Then it is evident, when a person speaks at B in the trumpet, the whole force of his voice is spent upon the air contained in the tube, which will be agitated through the whole length of the tube; and, by various reflections from the side of the tube to the axis, the air along the middle part of the tube will be greatly condensed, and its *momentum* proportionably increased, so that when it comes to agitate the air at the orifice of the tube AC, its force will be as much greater than what it would have been without the tube, as the surface of a sphere, whose radius is equal to the length of the tube, is greater than the surface of the segment of such a sphere whose base is the orifice of the tube. For a person speaking at B, without the tube, will have the force of his voice spent in exciting concentric superficies of air all around the point B; and when those superficies or pulses of air are diffused as far as D every way, it is plain the force of the voice will there be diffused through the whole superficies of a sphere whose radius is BD; but in the trumpet it will be so confined, that at its exit it will be diffused through so much of that spherical surface of air as corresponds to the orifice of the tube. But since the force is given, its intensity will be always inversely as the number of particles it has to move; and therefore

VOL. I. Part I.

in the tube it will be to that without, as the superficies of such a sphere to the area of the large end of the tube nearly.

But it is obvious, Mr Young observes, that the confinement of the voice can have little effect in increasing the strength of the sound, as this strength depends on the velocity with which the particles move. Were this reasoning conclusive, the voice should issue through the smallest possible orifice; cylindrical tubes would be preferable to any that increased in diameter; and the less the diameter, the greater would be the effect of the instrument; because the plate or mass of air to be moved, would, in that case, be less, and consequently the effect of the voice the greater; all which is contradicted by experience.

The cause of the increase of sound in these tubes must therefore be derived from some other principles: and amongst these we shall probably find, that what the ingenious Kircher has suggested in his *Phonurgia* is the most deserving of our attention. He tells us, that "the augmentation of the sound depends on its reflection from the tremulous sides of the tube; which reflections, conspiring in propagating the pulses in the same direction, must increase its intensity." Newton also seems to have considered this as the principle cause, in the scholium of prop. 50. B. 2. Princip. when he says, "we hence see why sounds are so much increased in stentorophonic tubes, for every reciprocal motion is, in each return, increased by the generating cause."

Farther, when we speak in the open air, the effect on the tympanum of a distant auditor is produced merely by a single pulse. But when we use a tube, all the pulses propagated from the mouth, except those in the direction of the axis, strike against the sides of the tube, and every point of impulse becoming a new centre, from whence the pulses are propagated in all directions, a pulse will arrive at the ear from each of those points; thus, by the use of a tube, a greater number of pulses are propagated to the ear, and consequently the sound increased. The confinement too of the voice may have some effect, though not such as is ascribed to it by some; for the condensed pulses produced by the naked voice, freely expand every way; but in tubes, the lateral expansion being diminished, the direct expansion will be increased, and consequently the velocity of the particles, and the intensity of the sound. The substance also of the tube has its effect; for it is found by experiment, that the more elastic the substance of the tube, and consequently the more susceptible it is of these tremulous motions, the stronger is the sound.

If the tube be laid on any non-elastic substance, it deadens the sound, because it prevents the vibratory motion of the parts. The sound is increased in speaking-trumpets, if the tube be suspended in the air; because the agitations are then carried on without interruption. These tubes should increase in diameter from the mouth-piece, because the parts, vibrating in directions perpendicular to the surface, will conspire in impelling forward the particles of air, and consequently, by increasing their velocity, will increase the intensity of the sound: and the surface also increasing, the number of points of impulse and of new propagations will increase

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(E) A cylindric or elliptic arch will answer still better than one that is circular.

Reverberated
Sounds.

proportionally. The several causes, therefore, of the increase of sound in these tubes, Mr Young concludes to be, 1. The diminution of the lateral, and consequently the increase of the direct, expansion and velocity of the included air. 2. The increase of the number of pulses, by increasing the points of new propagation. 3. The reflections of the pulses from the tremulous sides of the tube, which impel the particles of air forward, and thus increase their velocity.

16
Echoes.

An echo is a reflection of sound striking against some object, as an image is reflected in a glass: but it has been disputed what are the proper qualities in a body for thus reflecting sounds. It is in general known, that caverns, grottoes, mountains, and ruined buildings, return this image of sound. We have heard of a very extraordinary echo, at a ruined fortress near Louvain, in Flanders. If a person sung, he only heard his own voice, without any repetition: on the contrary, those who stood at some distance, heard the echo but not the voice; but then they heard it with surprising variations, sometimes louder, sometimes softer, now more near, then more distant. There is an account in the memoirs of the French academy, of a similar echo near Rouen.

As (by n^o 21 and 22) every point against which the pulses of sound strike becomes the centre of a new series of pulses, and sound describes equal distances in equal times; therefore, when any sound is propagated from a centre, and its pulses strike against a variety of obstacles, if the sum of the right lines drawn from that point to each of the obstacles, and from each obstacle to a second point, be equal, then will the latter be a point in which an echo will be heard. "Thus let A be the point from which the sound is propagated in all directions, and let the pulses strike against the obstacles C, D, E, F, G, H, I, &c. each of these points becomes a new centre of pulses by the first principle, and therefore from each of them one series of pulses will pass through the point B. Now if the several sums of the right lines $AC+CB$, $AD+DB$, $AE+EB$, $AG+GB$, $AH+HB$, $AI+IB$, &c. be all equal to each other, it is obvious that the pulses propagated from A to these points, and again from these points to B, will all arrive at B at the same instant, according to the second principle; and therefore, if the hearer be in that point, his ear will at the same instant be struck by all these pulses. Now it appears from experiment (see *Muschenbroek*, V. ii. p. 210), that the ear of an exercised musician can only distinguish such sounds as follow one another at the rate of 9 or 10 in a second, or any slower rate: and therefore, for a distinct perception of the direct and reflected sound, there should intervene the interval of $\frac{1}{9}$ th of a second; but in this time sound describes $\frac{1142}{9}$ or 127 feet nearly. And therefore, unless the sum of the lines drawn from each of the obstacles to the points A and B exceeds the interval AB by 127 feet, no echo will be heard at B. Since the several sums of the lines drawn from the obstacles to the points A and B are of the same magnitude, it appears that the curve passing through all the points C, D, E, F, G, H, I, &c. will be an ellipse, (*prop.* 14. B. 2. *Ham. Con.*) Hence all the points of the obstacles which produce an echo, must lie in the surface of

the oblong sphaeroid, generated by the revolution of this ellipse round its major axis.

"As there may be several sphaeroids of different magnitudes, so there may be several different echoes of the same original sound. And as there may happen to be a greater number of reflecting points in the surface of an exterior sphaeroid than in that of an interior, a second or a third echo may be much more powerful than the first, provided that the superior number of reflecting points, that is, the superior number of reflected pulses propagated to the ear, be more than sufficient to compensate for the decay of sound which arises from its being propagated through a greater space. This is finely illustrated in the celebrated echoes at the lake of Killarney in Kerry, where the first return of the sound is much inferior in strength to those which immediately succeed it.

"From what has been laid down it appears, that for the most powerful echo, the sounding body should be in one focus of the ellipse which is the section of the echoing sphaeroid, and the hearer in the other. However, an echo may be heard in other situations, though not so favourably; as such a number of reflected pulses may arrive at the same time at the ear as may be sufficient to excite a distinct perception. Thus a person often hears the echo of his own voice; but for this purpose he should stand at least 63 or 64 feet from the reflecting obstacle, according to what has been said before. At the common rate of speaking, we pronounce not above three syllables and an half, that is, seven half syllables in a second; therefore, that the echo may return just as soon as three syllables are expressed, twice the distance of the speaker from the reflecting object must be equal to 1000 feet; for, as sound describes 1142 feet in a second, $\frac{1}{2}$ ths of that space, that is, 1000 feet nearly, will be described while six half or three whole syllables are pronounced: that is, the speaker must stand near 500 feet from the obstacle. And in general, the distance of the speaker from the echoing surface, for any number of syllables, must be equal to the seventh part of the product of 1142 feet multiplied by that number.

"In churches we never hear a distinct echo of the voice, but a confused sound when the speaker utters his words too rapidly; because the greatest difference of distance between the direct and reflected courses of such a number of pulses as would produce a distinct sound, is never in any church equal to 127 feet, the limit of echoes.

"But though the first reflected pulses may produce no echo, both on account of their being too few in number, and too rapid in their return to the ear; yet it is evident, that the reflecting surface may be so formed, as that the pulses which come to the ear after two reflections or more may, after having described 127 feet or more, arrive at the ear in sufficient numbers, and also so nearly at the same instant, as to produce an echo, though the distance of the reflecting surface from the ear be less than the limit of echoes. This is confirmed by a singular echo in a grotto on the banks of the little brook called the Dinan, about two miles from Castlecomber, in the county of Kilkenny. As you enter the cave, and continue speaking loud, no return of the voice is perceived; but on your arriving at

Reverberated
Sounds.

Entertain-
ing Experi-
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Entertain-
ing Experi-
ments, &c.

a certain point, which is not above 14 or 15 feet from the reflecting surface, a very distinct echo is heard. Now this echo cannot arise from the first course of pulses that are reflected to the ear, because the breadth of the cave is so small, that they would return too quickly to produce a distinct sensation from that of the original sound: it therefore is produced by those pulses, which, after having been reflected several times from one side of the grotto to the other, and having run over a greater space than 127 feet, arrive at the ear in considerable numbers, and not more distant from each other, in point of time, than the ninth part of a second."

This article shall be dismissed with a few inventions founded on some of the preceding principles, which may amuse a number of our readers.

Entertaining Experiments and Contrivances.

27
I. The Con-
verse Sta-
tue,
Plate I.
fig. 5.

I. PLACE a concave mirror of about two feet diameter, as AB (G), in a perpendicular direction. The focus of this mirror may be at 15 or 18 inches distance from its surface. At the distance of about five or six feet let there be a partition, in which there is an opening EF, equal to the size of the mirror; against this opening must be placed a picture, painted in water-colours, on a thin cloth, that the sound may easily pass through it (H).

Behind the partition, at the distance of two or three feet, place another mirror GH, of the same size as the former, and let it be diametrically opposite to it.

At the point C let there be placed the figure of a man seated on a pedestal, and let his ear be placed exactly in the focus of the first mirror: his lower jaw must be made to open by a wire, and shut by a spring; and there may be another wire to move the eyes: these wires must pass through the figure, go under the floor, and come up behind the partition.

Let a person, properly instructed, be placed behind the partition near the mirror. You then propose to any one to speak softly to the statue, by putting his mouth to the ear of it, assuring him that it will answer instantly. You then give the signal to the person behind the partition, who, by placing his ear to the focus I, of the mirror GH, will hear distinctly what the other said; and, moving the jaw and eyes of the statue by the wires, will return an answer directly, which will in like manner be distinctly heard by the first speaker.

This experiment appears to be taken from the Century of Inventions of the Marquis of Worcester; whose designs, at the time they were published, were treated with ridicule and neglect as being impracticable, but are now known to be generally, if not universally, practicable. The words of the Marquis are these: "How to make a brazen or stone head in the midst of a great field or garden, so artificial and natu-

ral, that though a man speak ever so softly, and even whisper into the ear thereof, it will presently open its mouth, and resolve the question in French, Latin, Welsh, Irish, or English, in good terms, uttering it out of its mouth, and then shut it until the next question be asked."—The two following, of a similar nature, appear to have been inventions of Kircher, by means of which, (as he informs us *) he used to "utter • *Phonur-* feigned and ludicrous consultations, with a view to *gia Nova*. show the fallacy and imposture of ancient oracles." *sect. vi. c. x.*

II. LET there be two heads of plaster of Paris, placed on pedestals, on the opposite sides of a room. There must be a tin tube of an inch diameter, that must pass from the ear of one head, through the pedestal, under the floor, and go up to the mouth of the other. Observe, that the end of the tube which is next the ear of the one head, should be considerably larger than that end which comes to the mouth of the other. Let the whole be so disposed that there may not be the least suspicion of a communication. *28*

Now, when a person speaks, quite low, into the ear of one bust, the sound is reverberated thro' the length of the tube, and will be distinctly heard by any one who shall place his ear to the mouth of the other. It is not necessary that the tube should come to the lips of the bust.—If there be two tubes, one going to the ear, and the other to the mouth, of each head, two persons may converse together, by applying their mouth and ear reciprocally to the mouth and ear of the busts; and at the same time other persons that stand in the middle of the chamber, between the heads, will not hear any part of their conversation.

III. PLACE a bust on a pedestal in the corner of a room, and let there be two tubes, as in the foregoing amusements, one of which must go from the mouth and the other from the ear of the bust, through the pedestal, and the floor, to an under apartment. There may be likewise wires that go from the under jaw and the eyes of the bust, by which they may be easily moved. *29*

A person being placed in the under room, and at a signal given applying his ear to one of the tubes, will hear any question that is asked, and immediately reply; moving at the same time, by means of the wires, the mouth and the eyes of the bust, as if the reply came from it.

IV. IN a large case, such as is used for dials and spring-clocks, the front of which, or at least the lower part of it, must be of glass, covered on the inside with gauze, let there be placed a barrel-organ, which, when wound up, is prevented from playing, by a catch that takes a toothed wheel at the end of the barrel. To one end of this catch there must be joined a wire, at the end of which there is a flat circle of cork, of the same dimension with the inside of a glass tube, in which it is to rise and fall. This tube must communicate with a reservoir that goes across the front part of the bottom of the case, which is to be filled with spirits, such as is used in *30*

M 2

ther-

(G) Both the mirrors here used may be of tin or gilt pasteboard, this experiment not requiring such as are very accurate.

(H) The more effectually to conceal the cause of this allusion, the mirror AB may be fixed in the wainscot, and a gauze or any other thin covering thrown over it, as that will not in the least prevent the sound from being reflected. An experiment of this kind may be performed in a field or garden, between two hedges, in one of which the mirror AB may be placed, and in the other an opening artfully contrived.

Entertain-
ing Experi-
ments, &c.

thermometers, but not coloured, that it may be the better concealed by the gauze.

This case being placed in the sun, the spirits will be rarefied by the heat; and rising in the tube, will lift up the catch or trigger, and set the organ in play: which it will continue to do as long as it is kept in the sun; for the spirits cannot run out of the tube, that part of the catch to which the circle is fixed being prevented from rising beyond a certain point by a check placed over it.

When the machine is placed against the side of a room on which the sun shines strong, it may constantly remain in the same place, if you inclose it in a second case, made of thick wood, and placed at a little distance from the other. When you want it to perform, it will be only necessary to throw open the door of the outer case, and expose it to the sun.

But if the machine be moveable, it will perform in all seasons by being placed before the fire; and in the winter it will more readily stop when removed into the cold.

A machine of this sort is said to have been invented by Cornelius Dreble, in the last century. What the construction of that was, we know not; it might very likely be more complex, but could scarce answer the intention more readily.

31
Automa-
tous Harp-
sichord.

V. UNDER the keys of a common harpsichord let there be fixed a barrel, something like that in a chamber organ, with stops or pins corresponding to the tunes you would have it play. These stops must be moveable, so that the tunes may be varied at pleasure. From each of the keys let there go a wire perpendicular down: the ends of these wires must be turned up for about one-fourth of an inch. Behind these wires let there be an iron bar, to prevent them from going too far back. Now, as the barrel turns round, its pins take the ends of the wires, which pull down the keys, and play the harpsichord. The barrel and wires are to be all inclosed in a case.

In the chimney of the same room where the harpsichord stands, or at least in one adjacent, there must be a smoke jack, from whence comes down a wire, or cord, that, passing behind the wainscot adjoining the chimney, goes under the floor, and up one of the legs

of the harpsichord, into the case, and round a small wheel fixed on the axis of that first mentioned. There should be pullies at different distances, behind the wainscot and under the floor, to facilitate the motion of the chord.

This machinery may be applied to any other keyed instrument as well as to chimes, and to many other purposes where a regular continued motion is required.

An instrument of this sort may be considered as a perpetual motion, according to the vulgar acceptance of the term; for it will never cease going till the fire be extinguished, or some parts of the machinery be worn out.

VI. AT the top of a summer-house, or other building, let there be fixed a vane AB, on which is the pinion C, that takes the toothed wheel D, fixed on the axis EF, which at its other end carries the wheel G, that takes the pinion H. All these wheels and pinions are to be between the roof and the ceiling of the building. The pinion H is fixed to the perpendicular axis IK, which goes down very near the wall of the room, and may be covered after the same manner as are bell-wires. At the lower end of the axis IK there is a small pinion L, that takes the wheel M, fixed on the axis of the great wheel NO. In this wheel there must be placed a number of stops, corresponding to the tunes it is to play. These stops are to be moveable, that the tunes may be altered at pleasure. Against this wheel there must hang 12 small bells, answering to the notes of the gamut. Therefore, as the wheel turns round, the stops striking against the bells play the several tunes. There should be a fly to the great wheel, to regulate its motion when the wind is strong. The wheel NO, and the bells, are to be inclosed in a case.

32
A Ventofal
Symphony,
Plate I.
fig. 6.

There may be several sets of bells, one of which may answer to the tenor, another to the treble, and a third to the bass; or they may play different tunes, according to the size of the wheel. As the bells are small, if they are of silver, their tone will be the more pleasing.

Instead of bells, glasses may be here used, so disposed as to move freely at the stroke of the stops. This machinery may likewise be applied to a barrel-organ; and to many other uses.

A C Q

Acqs
||
Acqui.

ACQS, a town at the foot of the Pyrenæan mountains, in the government of Foix in France. It takes its name from the hot waters in these parts. E. long. 1. 40. lat. 43. 0.

ACQUAPENDENTE, a pretty large town of Italy, in the territory of the church, and patrimony of St Peter, with a bishop's see. It is seated on a mountain, near the river Paglia, ten miles W. of Orvietto, and 57 N. by W. of Rome. E. long. 11. 53. Lat. 42. 43.

ACQUARIA, a small town of Italy, in Frigana, a district of Modena, which is remarkable for its medicinal waters. It is 12 miles south of the city of Modena. E. long. 11. 17. Lat. 44. 24.

ACQUEST, or ACQUIST, in law, signifies goods got by purchase or donation. See CONQUEST.

ACQUI, a town of Italy, in the duchy of Mont-

A C Q

ferrat, with a bishop's see, and commodious baths. It was taken by the Spaniards in 1745, and retaken by the Piedmontese in 1746; but after this, it was taken again and dismantled by the French, who afterwards forsook it. It is seated on the river Bornio, 25 miles N. W. of Genoa, and 30 S. of Casal. E. long. 8. 30. Lat. 44. 40.

ACQUISITION, in general, denotes the obtaining or procuring something. Among lawyers, it is used for the right or title to an estate got by purchase or donation.

ACQUITTAL, a discharge, deliverance, or setting of a person free from the guilt or suspicion of an offence.

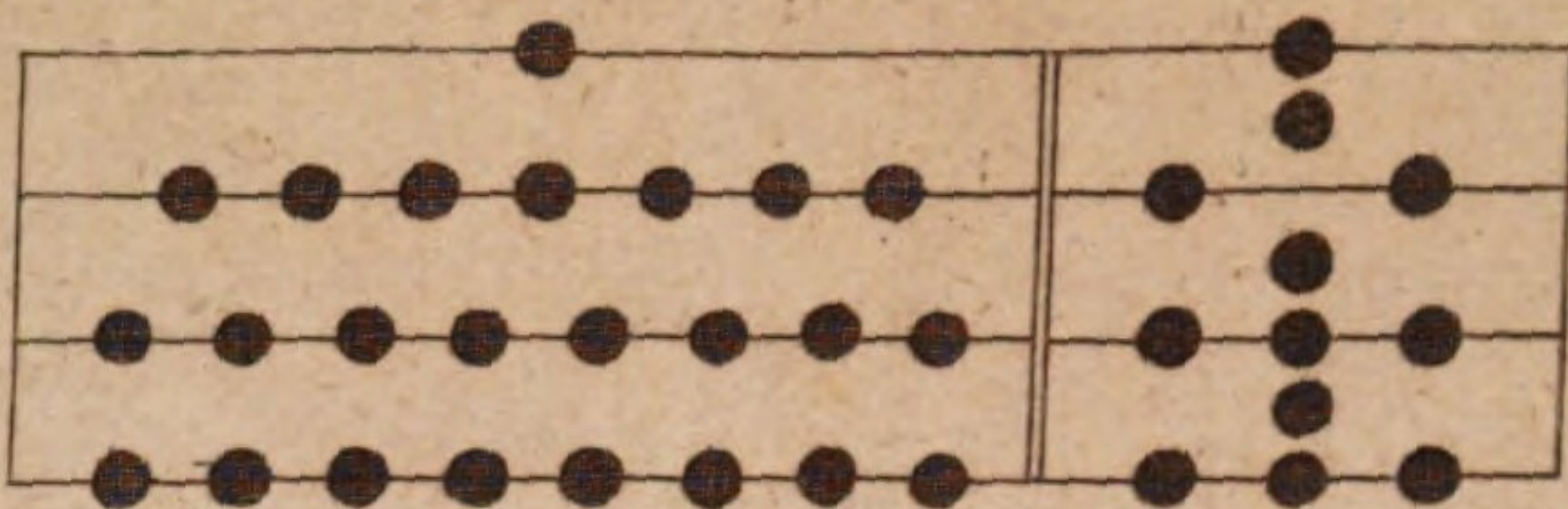
ACQUITTANCE, a release or discharge in writing for a sum of money, witnessing that the party has paid the said sum.—No man is obliged to pay a sum of money

It Acquisition
||
Acquit-
tance.

Aphis.



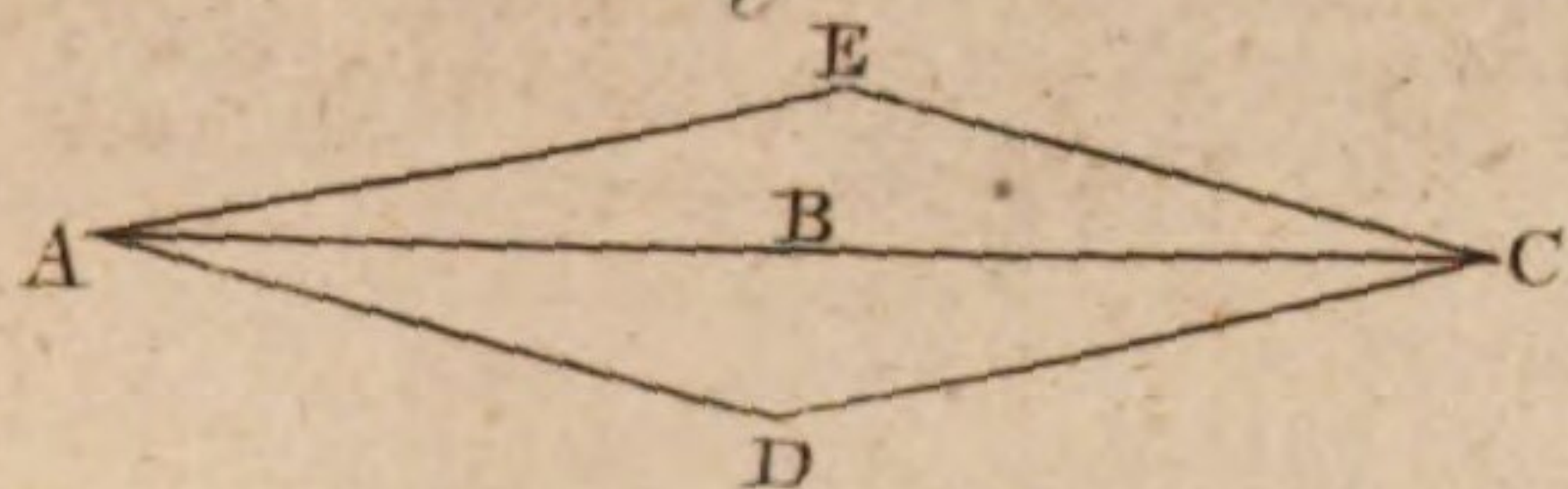
ABACUS.



Acarus.



Fig. 1.



Acoustics.
Fig. 2.



Fig. 7.

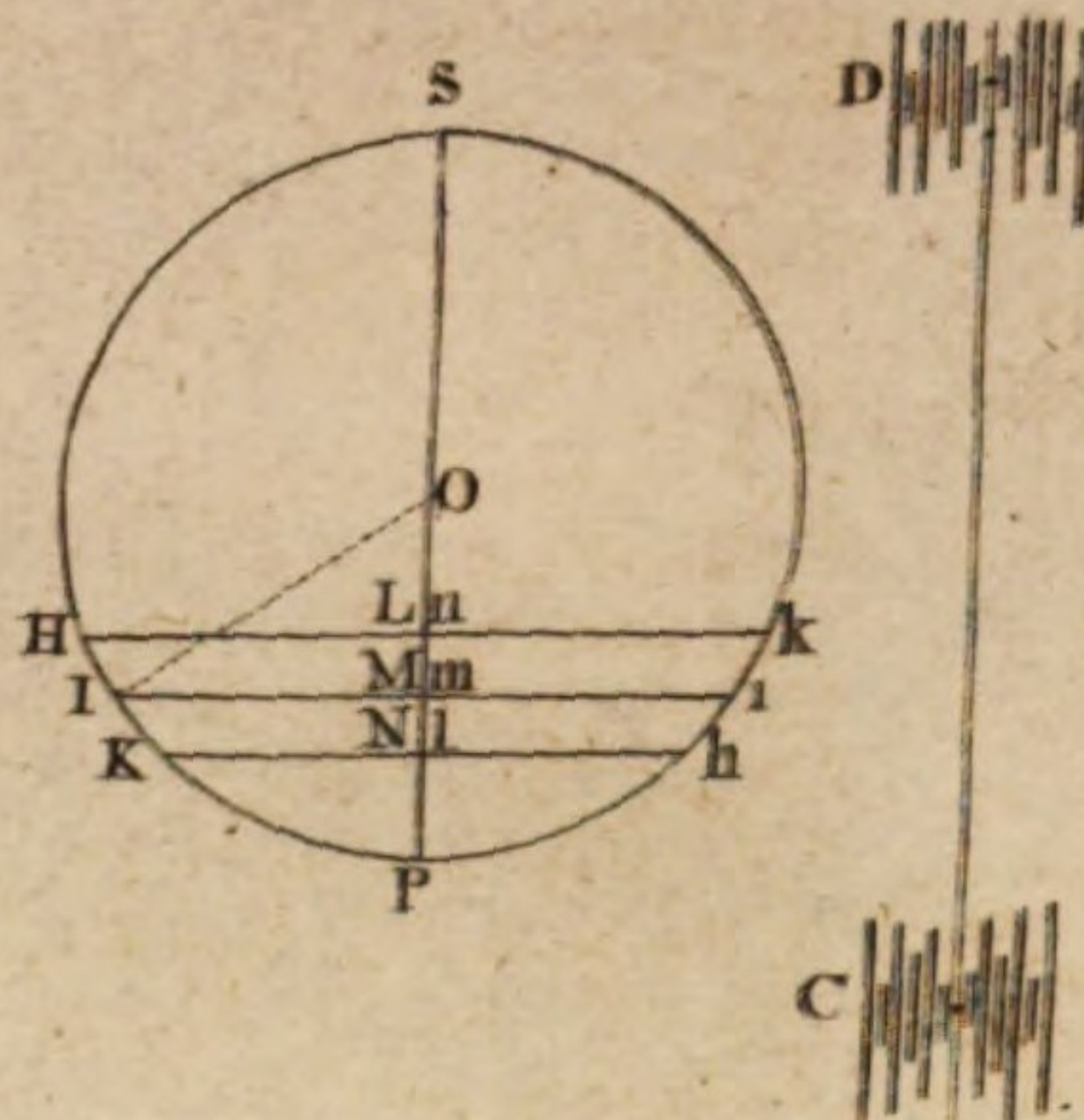


Fig. 3.

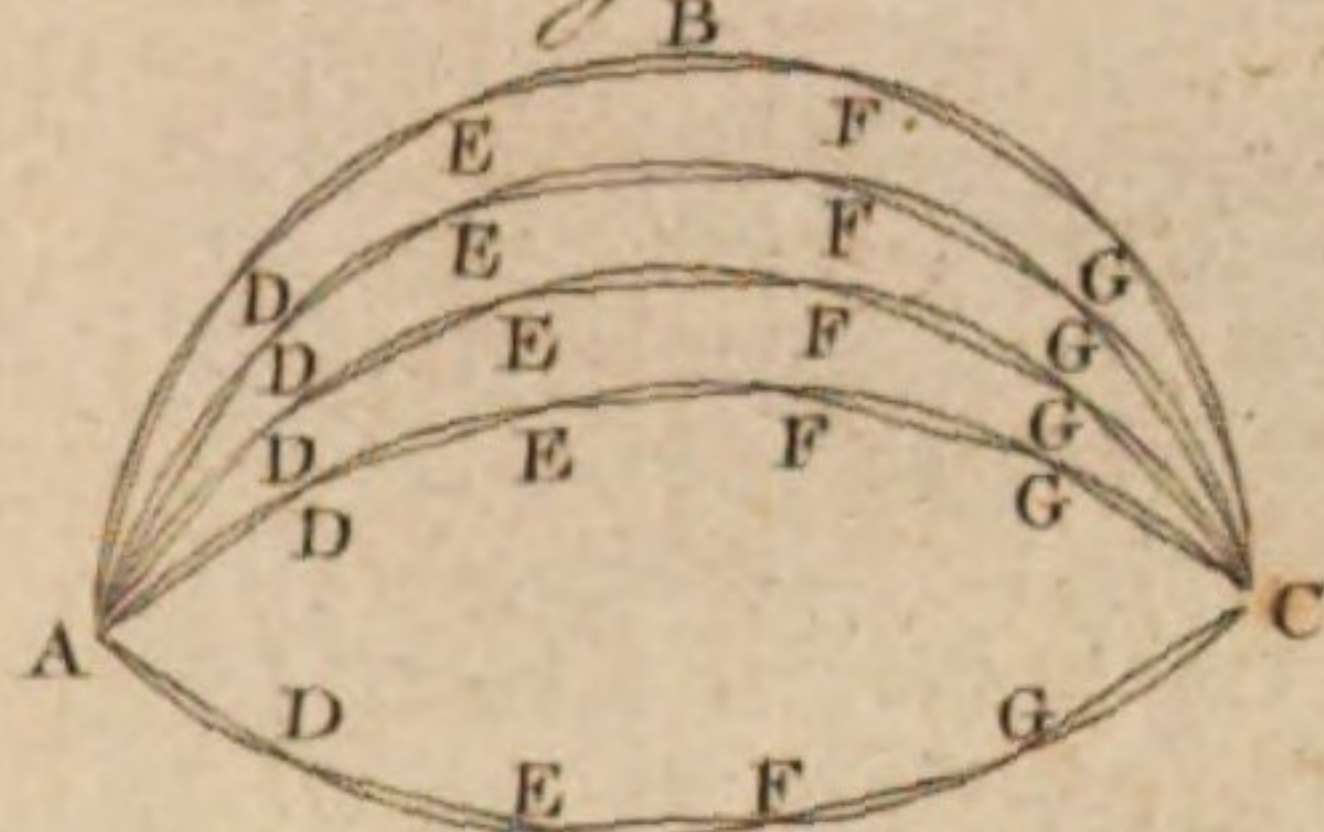


Fig. 4.



Fig. 5.

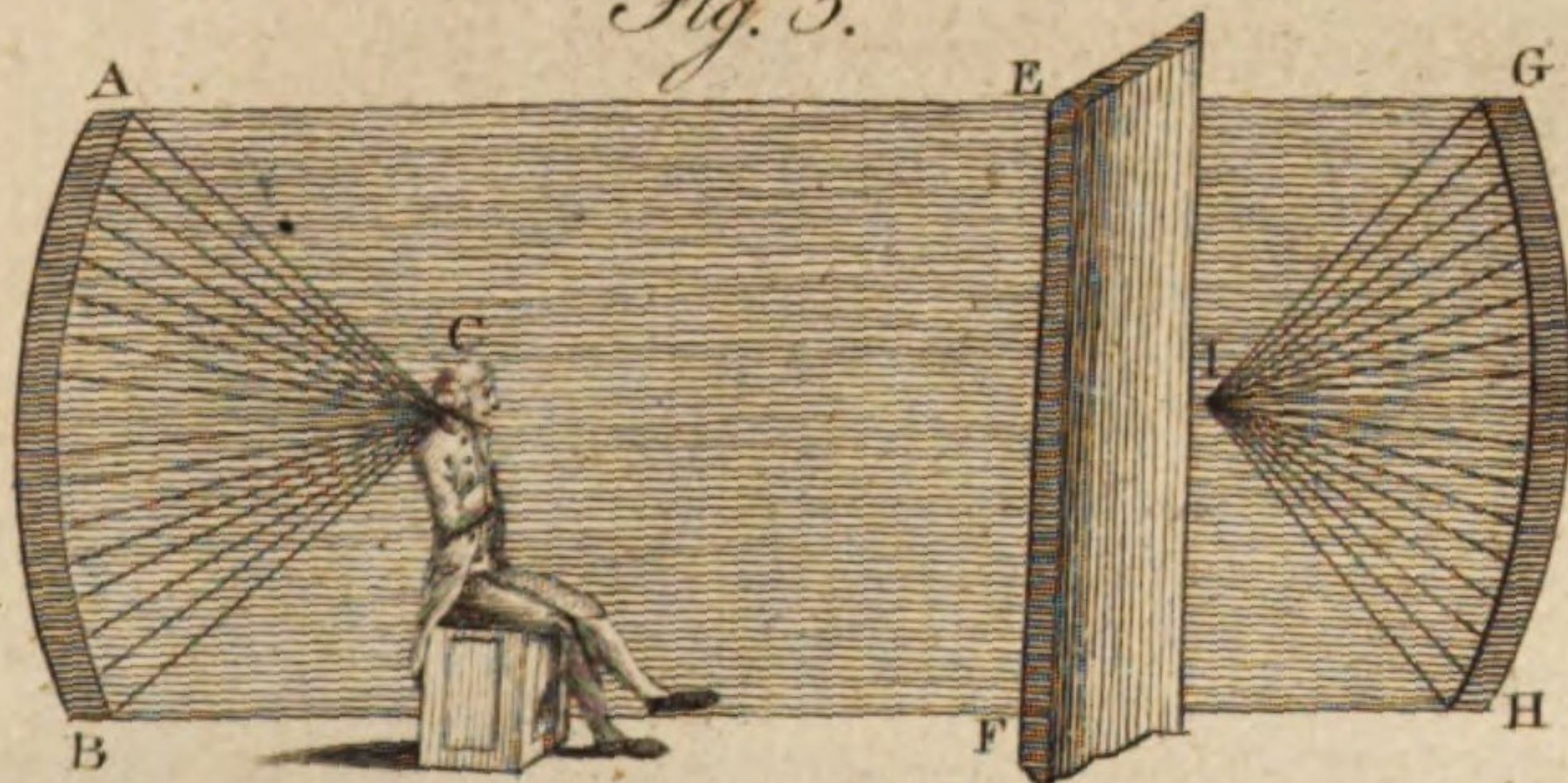
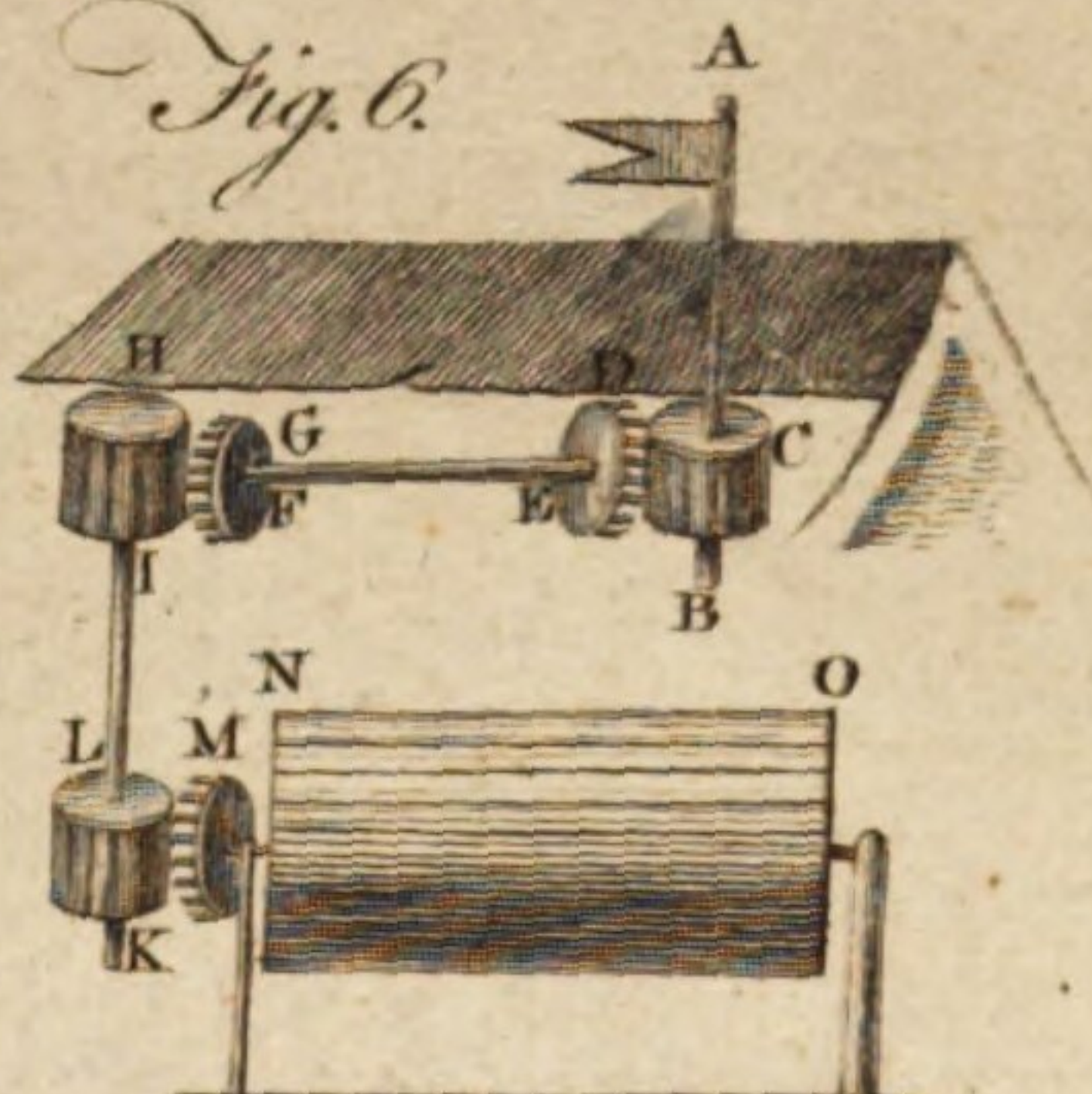


Fig. 6.



AEROSTATION.

Fig. 1.

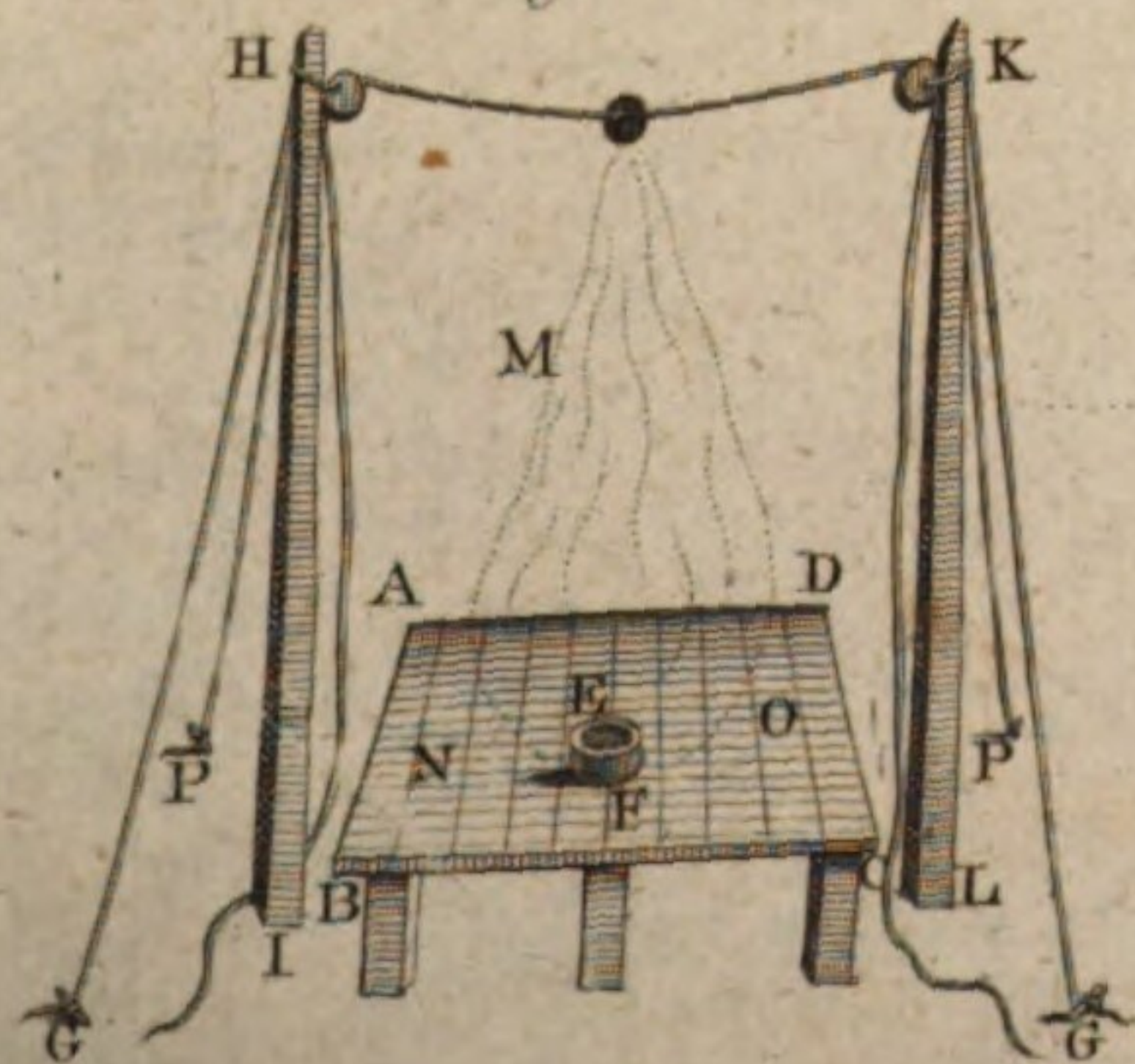
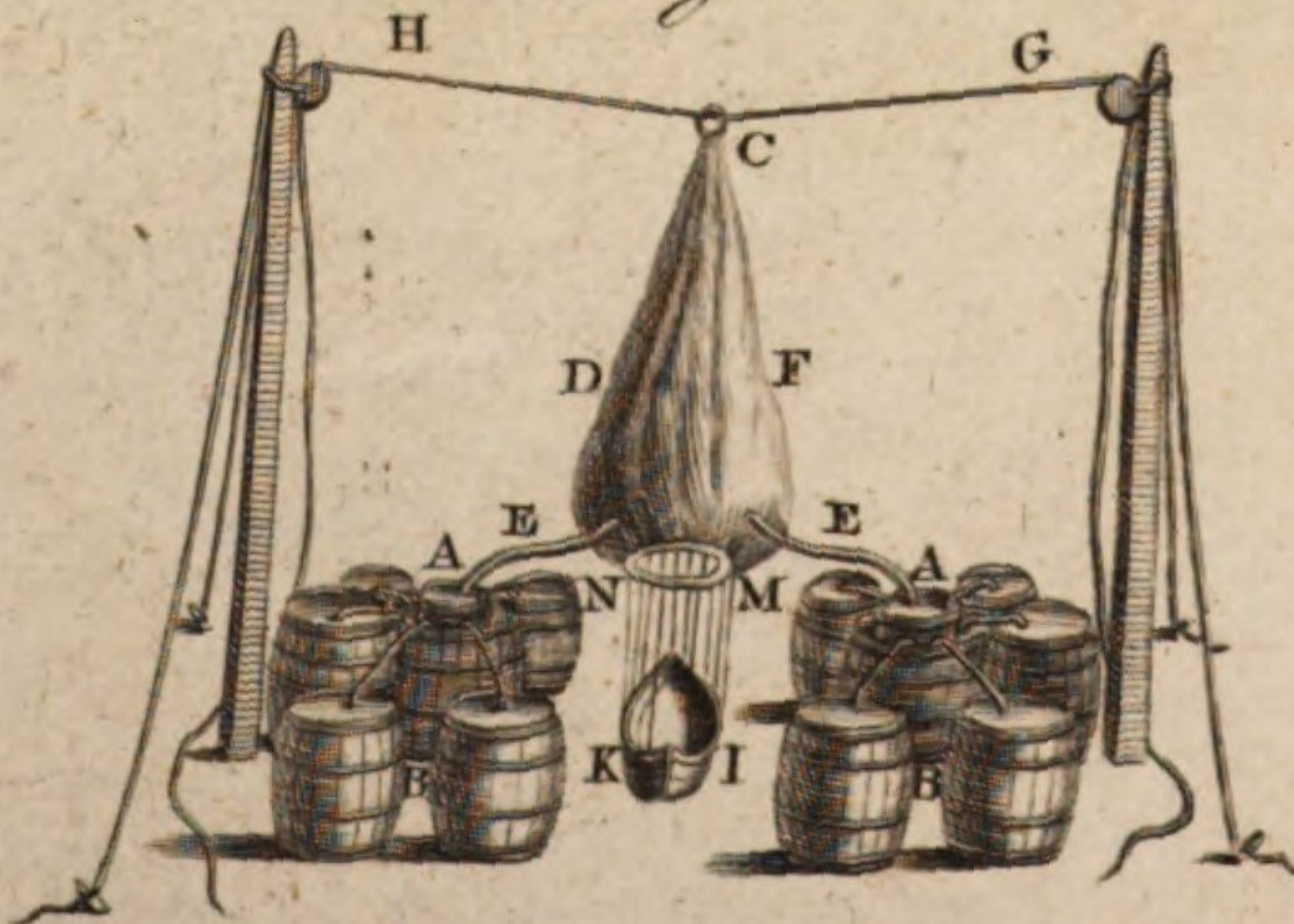


Fig. 2.



Acra
||
Acraſia.

money if the demandant refuses to give an acquittance, which is a full discharge, and bars all actions, &c. An acquittance given by a servant for a sum of money received for the use of his master, shall be a good discharge for that sum, provided the servant used to receive his master's rents, debts, &c.

ACRA, a town of Africa, on the coast of Guinea, where the English, Dutch, and Danes, have strong forts, and each fort its particular village. W. Long. 0. 2. Lat. 5. 0.

ACRA (anc. geog.), one of the hills of Jerusalem, on which stood the lower town, which was the Old Jerusalem; to which was afterwards added Zion, or the city of David. Probably called *Acra*, from the fortrefs which Antiochus built there in order to annoy the temple, and which Simon Maccabæus took and razed to the ground.

Acra Japygia (anc. geog.), called *Salentia* by Ptolemy; now *Capo di San Maria di Leuca*: A promontory in the kingdom of Naples, to the south-east of Otranto, where formerly was a town, now lying in ruins, on the Ionian sea, over against the Montes Acroceraunii of Epirus.

ACRÆ (anc. geog.), a town of Sicily, whose inhabitants were called *Acrenses*. It stood to the south of Syracuse at the distance of 24 miles, near the place now called the monastery of *Santa Maria d'Arcia*, on an eminence, as appears from Silius Italicus. The Syracusans were the founders of it, according to Thucydides, 70 years after the building of Syracuse, or 655 before Christ. Hence the epithet *Acræus*.

ACRAGAS, or AGRAGAS (anc. geog.), so called by the Greeks, and sometimes by the Romans, but more generally *Agrigentum* by the latter; a town of Sicily. In Greek medals the inhabitants are called *AKPIΓANTINOI*, and *Agrigentini* by Cicero. The town stood upon a mountain, at the confluence of the Acragas and Hypsa, near the port called *Εμποριον* by Ptolemy, but *Επιχειριον*, or the Dock, by Strabo; and in the time of the latter, scarce a trace of all that side remained. In the year before Christ 584, the people of Gela built Acragas, 108 years after building their own city. It took its name from the river running by it; and being but two miles from, enjoyed all the conveniences that should come by, the sea. It was a place of great strength, standing on the top of a very steep rock, and washed on the south side by the river Acragas, now called *Fiume di Gergenti*, and on the south-west by the Hypsa, with a citadel to the south-east, externally surrounded by a deep gulf, which made it inaccessible but on the side next the town. It was famous for the tyrant Phalaris and his brazen bull. They were a people luxurious in their tables, and magnificent in their dwellings; of whom Empedocles, in Diogenes Laertius, says, that they lived to-day as if they were to die to-morrow, and built as if they were to live for ever. The country round the city was laid out in vine and olive yards, in the produce of which they carried on a great and profitable commerce with Carthage. E. Long. 13. 30. Lat. 37. 20.

ACRASIA, among physicians, implies the predominancy of one quality above another, either with regard to artificial mixtures, or the humours of the human body. The word is Greek, and compounded of

α, priv. and *μερουμεν*, to mix; q. d. not mixed in a just proportion.

ACRATH (anc. geog.), a place in Mauritania Tingitana, now supposed to be *Velez de Gomara*: A fortified town in the kingdom of Fez, with a citadel and commodious harbour on the Mediterranean, scarce a mile distant from Penon de Velez, a Spanish fort. W. Long. 5. Lat. 34. 45.

ACRE, or ACRA, a sea-port town in Syria. It was formerly called *Ptolemais*, and is a bishop's see. It was very famous in the time of the crusades, and underwent several sieges both by the Christians and Saracens. It is situated at the north angle of a bay, which extends in a semicircle of three leagues, as far as the point of Carmel.

During the crusades, the possession of this town was long disputed by the Christians and Saracens. In 1192 it was taken from the latter by Richard I. of England and Philip of France, who gave it to the knights of St John of Jerusalem, who kept possession of it 100 years, when it was retaken by the Saracens, and almost entirely destroyed. This event is rendered memorable by an act of singular resolution with which it was accompanied. A number of beautiful young nuns, terrified at the prospect of being exposed to the brutal lust of the infidels, determined to avoid the violation of their chastity, by rendering themselves objects of aversion. With this view they cut off their noses and mangled their faces. The Saracens, inflamed with resentment at a spectacle which prevented the gratification of their appetites, immediately put them all to the sword. After the expulsion of the crusaders, it remained almost deserted; but in our time has again revived by the industry of Daher; and the works erected by Djezzar, within the last ten years, have rendered it one of the principal towns upon the coast. The mosque of this Pacha is boasted as a masterpiece of eastern taste. The bazar, or covered market, is not inferior even to those of Aleppo; and its public fountain surpasses in elegance those of Damascus, though the water is of a very indifferent quality. The Pacha has derived the more honour from these works, as he was himself both the engineer and architect: he formed the plans, drew the designs, and superintended the execution.

The port of Acre is one of the best situated on the coast, as it is sheltered from the north and north-west winds by the town itself; but it is greatly choaked up since the time of Fakr-el-din. Djezzar has contented himself with making a landing-place for boats. The fortifications, though more frequently repaired than any other in all Syria, are of no importance: there are only a few wretched low towers, near the port, on which cannon are mounted; and these rusty iron pieces are so bad, that some of them burst every time they are fired. Its defence on the land side is merely a garden-wall, without any ditch.

Corn and cotton form the basis of the commerce of Acre, which is becoming more flourishing every day. Of late, the Pacha, by an abuse common throughout all the Turkish empire, has monopolized all the trade in his own hands; no cotton can be sold but to him, and from him every purchase must be made. In vain have the European merchants claimed the privileges granted

Acraſia,
||
Acre.

Acre.

granted them by the Sultan: Djezzar replied, that he was the Sultan in his country, and continued his monopoly. These merchants in general are French, and have six houses at Acre, with a consul: an Imperial agent too is lately settled there; also a resident for Russia.

That part of the bay of Acre in which ships anchor with the greatest security lies to the north of Mount Carmel, below the village of Haifa (commonly called *Caiffa*). The bottom is good holding ground, and does not chafe the cables; but the harbour is open to the north-west wind, which blows violently along all this coast. Mount Carmel, which commands it to the south, is a flattened cone, and very rocky; it is about 2000 feet high. We still find among the brambles wild vines and olive trees, which prove that industry has formerly been employed even in this ungrateful soil. On the summit is a chapel dedicated to the prophet Elias, which affords an extensive prospect over the sea and land. It is 20 miles S. of Tyre, and 37 N. of Jerusalem. E. Long. 39. 25. Lat. 32. 40.

ACRE, in the Mogul's dominions, the same with lack, and signifies the sum of 100,000 rupees; the rupee is of the value of the French crown of three livres, or 30 sols of Holland; an 100 lacks of rupees make a couron in Indostan, or 10,000,000 rupees: the pound Sterling is about eight rupees; according to which proportion, a lack of rupees amounts to 12,500 pounds Sterling.

ACRE, the universal measure of land in Britain. The word (formed from the Saxon *acher*, or the German *aker*, a field), did not originally signify a determined quantity of land, but any open ground, especially a wide champaign; and in this antique sense it seems to be preserved in the names of places, as Castle-acre, West-acre, &c. An acre in England contains four square roods, a rood 40 perches or poles of $16\frac{1}{2}$ feet each by statute. Yet this measure does not prevail in all parts of England, as the length of the pole varies in different counties, and is called *customary measure*, the difference running from the $16\frac{1}{2}$ feet to 28. The acre is also divided into 10 square chains, of 22 yards each, that is, 4840 square yards. An acre in Scotland contains four square roods; one square rood is 40 square falls; one square fall, 36 square ells; one square ell, nine square feet and 73 square inches; one square foot, 144 square inches. The Scots acre is also divided into 10 square chains; the measuring chain should be 24 ells in length, divided into 100 links, each link $8\frac{2}{3}$ inches; and so one square chain will contain 10,000 square links. The English statute-acre is about three roods and six falls standard-measure of Scotland.

The French acre, *arpent*, contains $1\frac{1}{4}$ English acre, or 54,450 square English feet, whereof the English acre contains only 43,560.—The Strasburg acre is about half an English acre.—The Welsh acre contains commonly two English ones.—The Irish acre is equal to one acre two roods and 19 perches $\frac{2}{3}$, English.

Dr Grew attempts to ascertain the number of acres in England, which, according to him, amounts to 46 millions and 80,000. The United Provinces are said to contain 4,382,000 acres: The province of Holland but one million of acres. The territory of the United States of America, according to calculations lately

made by order of Congress, contains 589 millions of Acre-Fight acres, exclusive of water, which is computed at 51 millions more.

ACRE-Fight, an old sort of duel fought by English and Scottish combatants, between the frontiers of their kingdoms, with sword and lance: it was also called *camp-fight*, and the combatants *champions*, from the open field being the stage of trial.

ACRE-Tax, a tax laid on land at so much per acre. In some places this is also called *acre-shot*. Impositions on lands in the great level are to be raised by a proportionable acre-tax, 20 Car. II. cap. 8.—An acre-tax of 2s. 6d. per acre, for draining Hadenham-level, 13 Geo. I. cap. 18.

ACRIBELA, a term purely Greek, literally denoting an exquisite or delicate accuracy; sometimes used in our language, for want of a word of equal signification.

ACRID, a name for any thing that is of a sharp or pungent taste. SE MATERIA MEDICA.

ACRIDOPHAGI, in the ancient geography, an Ethiopian people, represented as inhabiting near the deserts, and to have fed on locusts. This latter circumstance their name imports; the word being compounded of the Greek *akris* locust, and *phago* to eat. We have the following account of them by Diodorus Siculus*. Their stature was lower than that of other men; they were meagre, and extremely black. In the spring, high west winds drove from the desert to their quarter locusts of an extraordinary size, and remarkable for the squalid colour of their wings. So great was the number of these insects, that they were the only sustenance of the barbarians, who took them in the following manner: At the distance of some stadia from their habitations there was a wide and deep valley. They filled this valley with wood and wild herbs, with which their country abounded. When the cloud of locusts appeared, which were driven on by the wind, they set fire to the fuel which they had collected. The smoke which arose from this immense fire was so thick, that the locusts, in crossing the valley, were stifled by it, and fell in heaps on the ground. The passage of the locusts being thus intercepted for many days, they made a large provision of those insects. As their country produced great quantities of salt, they salted them, to render them more palatable, and to make them keep till the next season. This peculiar supply was their sole food: they had neither herds nor flocks. They were unacquainted with fishing; for they lived at a distance from the sea. They were very active, and ran with great swiftness. But their life was not of long duration; it exceeded not 40 years. The close of their life was extremely miserable; for in their old age, winged lice of different, but all of ugly forms, bred in their bodies. This malady, which began in the breast and belly, soon spread through the whole frame. The patient at first felt an itching; and the agreeable sensation produced by his scratching of himself, preceded a most deplorable calamity. For when those lice, which had bred in his body, forced their way out, they caused effusions of corrupt blood, with excruciating pains in the skin. The unhappy man, with lamentable cries, was industrious himself to make passages for them with his nails. In short, these lice issued forth successively from the wounds made by the hands

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Acridophagi.

* Lib. iii.
& xxxix.
Also Strabo,
lib. xvi.

Acridophagi.

hands of the patient, as from a vessel full of holes, and in such numbers that it was impossible to exterminate them.—Whether this extraordinary and dreadful distemper was occasioned by the food of the inhabitants of this country, or by a pestilential quality of their climate, it is difficult to determine. Indeed, as to the credibility of the whole account, we must leave the reader to judge.

But though the circumstances of these people should be deemed fabulous, yet may the *acridophagia* be true. It is well known, that to this day the inhabitants of Ethiopia, Arabia, &c. frequently use locusts as food. The reader will not be displeased if we lay before him the result of Dr Hasselquist's inquiries as to this particular, who travelled in Syria and Egypt so late as the year 1752. This ingenious gentleman, who travelled with a view to improve natural history, informs us, that he asked Franks, and many other people who had lived long in these countries, whether they had ever heard that the inhabitants of Arabia, Ethiopia, &c. used locusts as food. They answered that they had. He likewise asked the same question of Armenians, Cophites, and Syrians, who lived in Arabia, and had travelled in Syria and near the Red Sea; some of whom said they heard of such a practice, and others that they had often seen the people eat these insects. He at last obtained complete satisfaction on this head from a learned sheik at Cairo, who had lived six years in Mecca. This gentleman told him, in presence of M. le Grand the principal French interpreter at Cairo, and others, that a famine frequently rages at Mecca when there is a scarcity of corn in Egypt, which obliges the inhabitants to live upon coarser food than ordinary: That when corn is scarce, the Arabians grind the locusts in hand-mills, or stone-mortars, and bake them into cakes, and use these cakes in place of bread: That he has frequently seen locusts used by the Arabians, even when there was no scarcity of corn; but then they boil them, stew them with butter, and make them into a kind of fricasee; which he says is not disagreeably tasted, for he had sometimes tasted these locust fricasees out of curiosity.

* *Voyage to the Cape*, vol. 1. p. 36. A later traveller, Dr Sparrman, informs us, "That locusts sometimes afford a high treat to the more unpolished and remote hordes of the Hottentots; when, as sometimes happens, after an interval of 8, 10, 15, or 20 years, they make their appearance in incredible numbers. At these times they come from the north, migrating to the southward, and do not suffer themselves to be impeded by any obstacles, but fly boldly on, and are drowned in the sea whenever they come to it. The females of this race of insects, which are most apt to migrate, and are chiefly eaten, are said not to be able to fly; partly by reason of the shortness of their wings; and partly on account of their being heavy and distended with eggs; and shortly after they have laid these in the sand, they are said to die. It is particularly of these that the Hottentots make a brown coffee-coloured soup, which, at the same time, acquires from the eggs a fat and greasy appearance. The Hottentots are highly rejoiced at the arrival of these locusts, though they are sure to destroy every bit of verdure on the ground: but the Hottentots make themselves ample amends for this loss, by falling foul on the animals themselves, eating them in

such quantities as in the space of a few days to get visibly fatter and in better condition than before."

The Abbé Poiret, also, in his Memoir on the Insects of Barbary and Numidia, informs us, "That the Moors make locusts a part of their food; that they go to hunt them; fry them in oil and butter; and sell them publicly at Tunis, at Bonne," &c.

From these accounts, we may see the folly of that dispute among divines about the nature of St John's food in the wilderness: some maintaining the original word to signify the fruits of certain trees; others, a kind of birds, &c.: but those who adhered to the literal meaning of the text were at least the most orthodox, although their arguments were perhaps not so strong as they might have been, had they had an opportunity of quoting such authors as the above.

ACRISIUS, king of Argos (fab. hist.), being told by the oracle that he should be killed by his grandchild, shut up his only daughter Danaë in a brazen tower: but Jupiter coming down in a golden shower, begot Perseus upon her: after Perseus had slain the Gorgons, he carried Medusa's head to Argos; which Acrisius seeing, was turned into a statue.

ACRITAS (anc. geog.), a promontory of Messenia, running into the sea, and forming the beginning of the bay of Messene. Now called *Capo di Gallo*, between Methone to the west, and Corone to the east, where the Sinus Coronæus begins.

ACROAMATIC, or ACROATIC, in general, denotes a thing sublime, profound, or abstruse.

ACROAMATICI, a denomination given the disciples or followers of Aristotle, &c. who were admitted into the secrets of the inner or acroamatic philosophy.

ACROATIC. Aristotle's lectures to his disciples were of two kinds, *exoteric* and *acroatic*. The acroatic were those to which only his own disciples and intimate friends were admitted; whereas the exoteric were public, and open to all. But there are other differences. The acroatic were set apart for the higher and more abstruse subjects; the exoteric were employed in rhetorical and civil speculations. Again, the acroatics were more subtle and exact, evidence and demonstration being here aimed at; the exoterics chiefly aimed at the probable and plausible. The former were the subject of the mornings exercises in the Lyceum, the latter of the evenings. Add, that the exoterics were published: whereas the acroatics were kept secret; being either entirely concealed; or, if they were published, it was in such obscure terms, that few but his own disciples could be the wiser for them. Hence, when Alexander complained of his preceptor for publishing his acroatics, and thus revealing what should have been reserved to his disciples, Aristotle answered, that they were made public and not public; for that none that had not heard them explained by the author *viva voce* would understand them.

ACROATHOUM, or ACROTHOUM (anc. geog.), a town situated on the top of mount Athos, where the inhabitants, according to Mela, were longer lived by half than in any other country: called by the modern Greeks *Άγιον ορος*; by the Italians, *La Cima di Monte Santo*.

ACROBATICA, or ACROBATICUM, from *ακρο*, high, and *βασις*, or *βαινα*, I go; an ancient engine, whereby

Acrisius

Acrobatica

Acroce-
raunia
||
Acropolis.

whereby people were raised aloft, that they might see more conveniently about them. The *acrobatica* among the Greeks amounted to the same with what they call *scanforium* among the Latins. Authors are divided as to the office of this engine. Turnebus and Barbarus take it to have been of the military kind, raised by besiegers, high enough to overlook the walls, and discover the state of things on the other side. Baldus rather supposes it a kind of moveable scaffold, or cradle, contrived for raising painters, plasterers, and other workmen, to the tops of houses, trees, &c. Some suspect that it might have been used for both purposes; which is the opinion of Vitruvius and Aquinas.

ACROCERAUNIA, or MONTES CERAUNII (anc. geog.), mountains running out into the sea (so called from their being often thunderstruck), separating the Ionian Sea from the Adriatic; where Illyria ends and Epirus begins: now called *Monti della Chimera*.

ACROCHERISMUS, among the Greeks, a sort of gymnastic exercise, in which the two combatants contended with their hands and fingers only, without closing or engaging the other parts of the body.

ACROCORINTHUS (anc. geog.), a high and steep hill, hanging over the city of Corinth, which was taken within the walls, as an acropolis, or citadel. On its top stood a temple of Venus; and lower down issued the fountain Pyrene.

ACROMION, in anatomy, the upper part of the scapula or shoulder-blade. See ANATOMY.

ACROMONOGRAMMATICUM, in poetry, a kind of poem, wherein every subsequent verse begins with the latter wherewith the immediately preceding one terminated.

ACRON, a celebrated physician of Agrigentum, who first thought of lighting large fires, and purifying the air with perfumes, to put a stop to the pestilence that ravaged Athens, and which was attended with success. He lived about 473 years before the Christian æra.

ACRON, a territory on the gold-coast of Guinea, in Africa, bordering on the Fantynean country. The Dutch have a fort here called Fort Patience; and under it is a village, inhabited only by fishermen. The other inhabitants are addicted to husbandry, and sell their corn to other countries. There is plenty of game, which is very commodious for the Dutch factory. The people are very ignorant, and go naked like the rest of the negroes. This is called Little Acron; for Great Acron is farther inland, and is a kind of a republic.

ACRONICAL, ACHRONICAL, or ACHRONICAL, in astronomy, is a term applied to the rising of a star, when the sun is set in the evening; but has been promiscuously used to express a star's rising at sunset, or setting at sun-rise.

ACRONIUS LACUS (Mela); a small lake formed by the Rhine, soon after its rise out of the Alps, and after passing the greater lake at Constance, called *Venetus*, and now the *Bodensee*, or lake of Constance.

ACROPOLIS (anc. geog.), the citadel, and one of the divisions of Athens; called *Polis*, because constituting the first and original city; and the *Upper Polis*, to distinguish it from the Lower, which was afterwards built round it in a large open plain, the Acropolis standing on a rock or eminence in the heart of

No 3.

this plain; and hence its name: To the north it had a wall, built by the Pelasgi, and therefore called *Pelagic*; and to the south a wall, by Cymon the son of Miltiades, out of the Persian spoils, many ages after the building of the north wall. It had nine gates, and was therefore called *Enneapylon*; yet but one principal gate or entrance, the ascent to which was by a flight of steps of white marble, built by Pericles with great magnificence (Plutarch).

ACROPOLITA (George), one of the writers in the Byzantine history, was born at Constantinople, in the year 1220, and brought up at the court of the emperor John Ducas at Nice. He was employed in the most important affairs of the empire; being sent ambassador to Larissa, to establish a peace with Michael of Epirus; and was constituted judge to try Michael Comnenus, suspected of engaging in a conspiracy. Theodorus Lascaris, the son of John, whom he had taught logic, appointed him governor of all the western provinces in his empire. In 1255, he was taken prisoner in a war with Michael Angelus: but gaining his liberty in 1260, by means of the emperor Palæologus, he was sent by him ambassador to Constantine prince of Bulgaria; and was employed in several other negotiations. He wrote, *A Continuation of the Greek History*, from the taking of Constantinople by the Latins till it was recovered by Michael Palæologus in 1261, which makes part of the Byzantine history; a *Treatise concerning Faith, Virtue, and the Soul*; *An Exposition of the Sermons of St Gregory Nazianzen* and other pieces. Gregory Cyprian, patriarch of Constantinople, in his encomium upon him, prefixed to Acropolis's history, is perhaps somewhat extravagant in his praise, when he says he was equal to Aristotle in philosophy, and to Plato in the knowledge of divine things and Attic eloquence.

ACROSPIRE, a vulgar term for what botanists call the *plume*. See the article PLANTS.

ACROSPIRED, in malt-making, is the grain's shooting both at the root and blade end.

ACROSTIC, in poetry, a kind of poetical composition, disposed in such a manner, that the initial letters of the verses form the name of some person, kingdom, place, motto, &c. The word is compounded of the Greek *ακρῶς*, *extremity*, and *στίχῳ*, *verse*. The acrostic is considered by the critics as a species of false wit, and is therefore very little regarded by the moderns.

ACROSTICUM, RUSTYBACK, WALL-RUE, or FORK-FERN, in botany, a genus of the cryptogamia filices. The fructifications are accumulated on the whole inferior surface of the frond, so that they everywhere cover it. There are upwards of 30 species; but only three of them (according to others, two) are natives of Britain, *viz.* the septentrionale, or horned fern, which grows on walls or cliffs of rocks; the ilvense, or hairy fern, growing in cliffs of rocks; and the thelypteris, or marsh fern, in turf bogs.

ACROSTOLIUM, in ancient naval architecture, the extreme part of the ornament used on the prows of their ships, which was sometimes in the shape of a buckler, helmet, animal, &c.; but more frequently circular, or spiral. It was usual to tear them from the prows of vanquished vessels, and fix them to the conquerors, as a signal of victory.

ACRO-

Acropolita
||
Acrostolium.

Acroteleu-
tic
||
Act.

ACROTELEUTIC, among ecclesiastic writers, an appellation given to any thing added to the end of a psalm; as the Gloria Patri, or Doxology.

ACROTHERIA, in architecture, small pedestals, usually without bases, anciently placed at the middle or two extremes of pediments or frontispieces, serving to support the statues, &c. It also signifies the figures placed as ornaments on the tops of churches, and the sharp pinnacles that stand in ranges about flat buildings with rails and ballusters.

Among ancient physicians, it signified the larger extremities of the body, as the head, hands, and feet. It has also been used for the tips of the fingers, and sometimes for the eminences or processes of bones.

ACROTHYMION, from *ακρῶς*, *extreme*, and *θυμός*, *thyme*. A sort of wart described by Celsus as hard, rough, with a narrow basis and broad top; the top is of the colour of thyme, it easily splits and bleeds. This tumour is also called *thymus*.

ACT, in general, denotes the exertion of power; and differs from power, as the effect from the cause.

ACT, in logic, is particularly understood of an operation of the human mind. Thus to discern and examine, are acts of the understanding; to judge and affirm, are acts of the will. There are voluntary and spontaneous acts; the former are produced by the operation of the soul, the latter without its privity or participation.

ACT, in the universities, signifies a thesis maintained in public by a candidate for a degree; or to show the capacity and proficiency of a student. The candidates for a degree of bachelor and master of arts are to hold philosophical Acts; and those for bachelor of divinity, theological Acts, &c. At Oxford, the time when masters or doctors complete their degrees is also called the *act*; which is held with great solemnity. At Cambridge, they call it the *commencement*.

Act of Faith, Auto da Fe, in the Romish church is a solemn day held by the inquisition, for the punishment of heretics, and the absolution of the innocent accused*. They usually contrive the *Auto* to fall on some great festival, that the execution may pass with the more awe and regard; at least it is always on a Sunday.

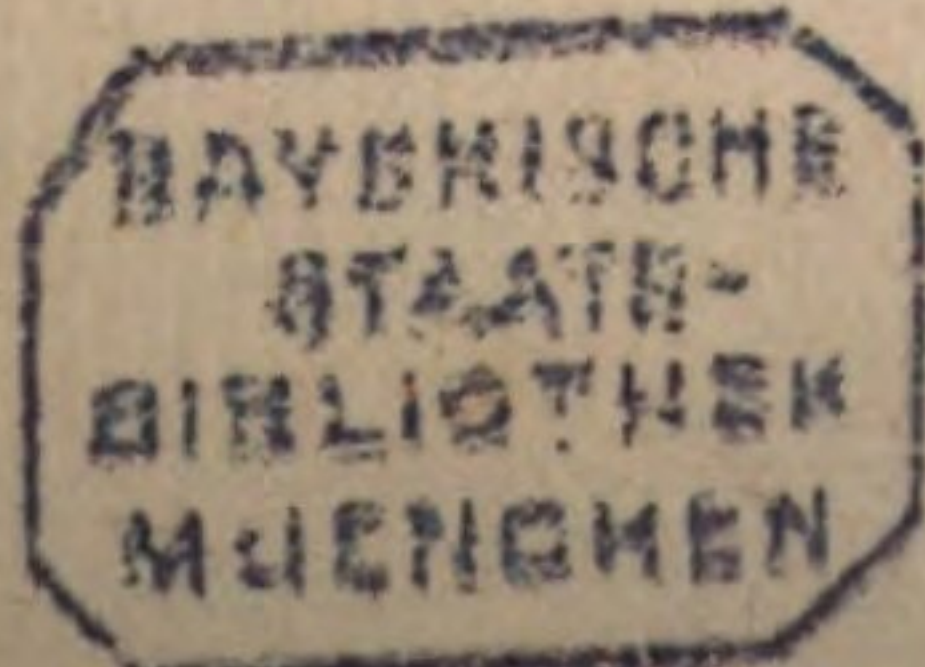
The *Auto da Fe* may be called the last act of the inquisitorial tragedy; it is a kind of goal-delivery, appointed as oft as a competent number of prisoners in the inquisition are convicted of heresy, either by their own voluntary, or extorted confession, or on the evidence of certain witnesses. The process is thus: in the morning they are brought into a great hall, where they have certain habits put on, which they are to wear in the procession. The procession is led up by dominican friars; after which come the penitents, some with *sah-benitoes*, and some without, according to the nature of their crimes; being all in black coats without sleeves, and bare-footed, with a wax candle in their hands. These are followed by the penitents who have narrowly escaped being burnt, who over their black coats have flames painted with their points turned downwards, *Feugo revolto*. Next come the negative, and relapsed, who are to be burnt, having flames on their habits pointing upwards. After these come such as profess doctrines contrary to the faith of Rome, who, besides flames pointing upwards, have their picture painted on their breasts, with dogs, serpents, and devils, all

open-mouthed, about it. Each prisoner is attended with a familiar of the inquisition; and those to be burnt have also a Jesuit on each hand, who are continually preaching to them to abjure. After the prisoners, comes a troop of familiars on horseback; and after them the inquisitors, and other officers of the court, on mules; last of all, the inquisitor-general on a white horse, led by two men with black hats and green hat-bands. A scaffold is erected in the *Terrero de Paio*, big enough for two or three thousand people; at one end of which are the prisoners, at the other the inquisitors. After a sermon made up of encomiums of the inquisition, and invectives against heretics, a priest ascends a desk near the middle of the scaffold, and having taken the abjuration of the penitents, recites the final sentence of those who are to be put to death; and delivers them to the secular arm, earnestly beseeching at the same time the secular power not to touch their blood, or put their lives in danger. The prisoners being thus in the hands of the civil magistrate, are presently loaded with chains, and carried first to the secular goal, and from thence in an hour or two brought before the civil judge; who, after asking in what religion they intend to die, pronounces sentence, on such as declare they die in the communion of the church of Rome, that they shall be first strangled, and then burnt to ashes; on such as die in any other faith, that they be burnt alive. Both are immediately carried to the Ribera, the place of execution; where there are as many stakes set up as there are prisoners to be burnt, with a quantity of dry furze about them. The stakes of the professed, that is, such as persist in their heresy, are about four yards high, having a small board towards the top for the prisoner to be seated on. The negative and relapsed being first strangled and burnt, the professed mount their stakes by a ladder; and the Jesuits, after several repeated exhortations to be reconciled to the church, part with them, telling them they leave them to the devil, who is standing at their elbow to receive their souls, and carry them with him into the flames of hell. On this a great shout is raised; and the cry is, Let the dogs beards be made; which is done by thrusting flaming furzes fastened to long poles against their faces, till their faces are burnt to a coal, which is accompanied with the loudest acclamations of joy. At last, fire is set to the furze at the bottom of the stake, over which the professed are chained so high, that the top of the flame seldom reaches higher than the seat they sit on; so that they rather seem roasted than burnt. There cannot be a more lamentable spectacle; the sufferers continually cry out, while they are able, *Misericordia per amor de Dios*, "Pity for the love of God!" yet it is beheld by all sexes, and ages, with transports of joy and satisfaction.

ACT, in dramatic poetry, signifies a certain division, or part, of a play, designed to give some respite both to the actors and spectators. The Romans were the first who divided their theatrical pieces into acts; for no such divisions appear in the works of the first dramatic poets. Their pieces indeed consisted of several parts or divisions, which they called *protasis*, *epitasis*, *catastasis*, and *catastrophe*; but these divisions were not marked by any real interruptions on the theatre. Nor does Aristotle mention any thing of acts in his Art of Poetry. But, in the time of Horace, all regular and finished pieces were divided into five acts.

Act.

* See Inquisition.



Act
||
Acta.*Neuve minor, neu sit quinto productior actu
Fabula, quæ posci vult & spectata reponi.*

The first act, according to some critics, besides introducing upon the stage the principal characters of the play, ought to propose the argument or subject of the piece; the second, to exhibit this to the audience, by carrying the fable into execution; the third, to raise obstacles and difficulties: the fourth, to remove these, or raise new ones in the attempt; and the fifth, to conclude the piece, by introducing some accident that may unravel the whole affair. This division, however, is not essentially necessary; but may be varied according to the humour of the author, or the nature of the subject. See POETRY, Part II. Sect. i.

Act of Grace. See GRACE.

ACT, among lawyers, is an instrument in writing for declaring or justifying the truth of any thing. In which sense, records, decrees, sentences, reports, certificates, &c. are called *acts*.

ACTS, also denote the deliberations and resolutions of an assembly, senate, or convention; as acts of parliament, &c. Likewise matters of fact transmitted to posterity in certain authentic books and memoirs.

Acta Consistorii, the edicts or declarations of the council of state of the emperors. These edicts were generally expressed in such terms as these: "The august emperors, *Dioclesian* and *Maximilian*, in council declared, That the children of Decurions should not be exposed to wild beasts in the amphitheatre."

The senate and soldiers often swore, either through abject flattery or by compulsion, upon the *edicts* of the emperor, as we do upon the *bible*. And the name of *Apudius Merula* was erased by Nero out of the register of senators, because he refused to swear upon the edicts of the emperor Augustus.

Acta Diurna, was a sort of Roman gazette, containing an authorized narrative of the transactions worthy of notice which happened at Rome. Petronius has given us a specimen of the *acta diurna* in his account of Trimalchis; and as it may not perhaps be unenterprising to see how exactly a Roman newspaper runs in the style of an English one, the following is an article or two out of it:

"On the 26th of July, 30 boys and 40 girls were born at Trimalchi's estate at Cuma.

"At the same time a slave was put to death for uttering disrespectful words against his lord.

"The same day a fire broke out in Pompey's gardens, which began in the night, in the steward's apartment."

Acta Populi, among the Romans, were journals or registers of the daily occurrences; as assemblies, trials, executions, buildings, births, marriages, deaths, &c. of illustrious persons, and the like. These were otherwise called *Acta Publica* and *Acta Diurna*, or simply *Acta*. The *Acta* differed from Annals, in that only the greater and more important matters were in the latter, and those of less note were in the former. Their origin is attributed to Julius Cæsar, who first ordered the keeping and making public the acts of the people. Some trace them higher, to Servius Tullius; who, to discover the number of persons born, dead, and alive, ordered that the next of kin, upon a birth, should put a certain piece of money into the treasury of Juno Lucina; upon a death, into that of Venus Libitina: the like was also to be done upon assuming the toga virilis,

&c. Under Marcus Antoninus, this was carried further: persons were obliged to notify the births of their children, with their names and surnames, the day, consul, and whether legitimate or spurious, to the præfects of the *Ærarium Saturni*, to be entered in the public acts; though before this time the births of persons of quality appear thus to have been registered.

Acta Senatus, among the Romans, were minutes of what passed and was debated in the senate house. These were also called *Commentarii*, and by a Greek name *ὑπομνηματα*. They had their origin in the consulship of Julius Cæsar, who ordered them both to be kept and published. The keeping them was continued under Augustus, but the publication was abrogated. Afterwards all writings, relating to the decrees or sentences of the judges, or what passed and was done before them, or by their authority, in any cause, were also called by the name *Acta*: In which sense we read of civil acts, criminal acts, intervenient acts; *acta civilia, criminalia, intervenientia*, &c.

Public Acts. The knowledge of public acts forms part of a peculiar science, called the *DIPLOMATIC*, of great importance to an historian, statesman, chronologer, and even critic. The preservation of them was the first occasion of erecting libraries. The style of acts is generally barbarous Latin. Authors are divided as to the rules of judging of their genuineness, and even whether there be any certain rules at all. F. Germon will have the greater part of the acts of former ages to be spurious. Fontanini asserts, that the number of forged acts now extant is very small. It is certain there were severe punishments inflicted on the forgers and falsifiers of acts.—The chief of the English acts, or public records, are published by Rymer, under the title of *Fœdera*, and continued by Saunderson; an extract whereof has been given in French by Rapin, and translated into English under the title of *Acta Regia*. Great commendations have been given this work: also some exceptions made to it; as that there are many spurious acts, as well as errors, in it; some have even charged it with falsifications.—The public acts of France fell into the hands of the English after the battle of Poitiers, and are commonly said to have been carried by them out of the country. But the tradition is not supported by any sufficient testimony.

Acts of the Apostles, one of the sacred books of the New Testament, containing the history of the infant-church, during the space of 29 or 30 years from the ascension of our Lord to the year of Christ 63.—It was written by St Luke; and addressed to Theophilus, the person to whom the evangelist had before dedicated his gospel. We here find the accomplishment of several of the promises made by our Saviour; his ascension; the descent of the Holy Ghost; the first preaching of the apostles, and the miracles whereby their doctrines were confirmed; an admirable picture of the manners of the primitive Christians; and, in short, every thing that passed in the church till the dispersion of the apostles, who separated themselves in order to propagate the gospel throughout the world. From the period of that separation, St Luke quits the history of the other apostles, who were then at too great a distance from him, and confines himself more particularly to that of St Paul, who had chosen him for the companion of his labours. He follows that apostle in all his missions,

Acta,
Acts.

Acts.

and even to Rome itself; for it appears that the Acts were published in the second year of St Paul's residence in that city, or the 36th year of the Christian æra, and in the 9th or 10th year of Nero's reign. The style of this work, which was originally composed in Greek, is much purer than that of the other canonical writers; and it is observable, that St Luke, who was much better acquainted with the Greek than with the Hebrew language, always, in his quotations from the Old Testament, makes use of the Septuagint version. The council of Laodicea places the Acts of the Apostles among the canonical books, and all the churches have acknowledged it as such without any controversy.

There were several *Spurious Acts of the Apostles*; particularly, I. *Acts*, supposed to be written by Abdias*, the pretended bishop of Babylon, who gave out that he was ordained bishop by the apostles themselves when they were upon their journey into Persia. II. *The Acts of St Peter*: this book came originally from the school of the Ebionites. III. *The Acts of St Paul*, which is entirely lost. Eusebius, who had seen it, pronounces it of no authority. IV. *The Acts of St John the Evangelist*; a book made use of by the Encratites, Manichæans, and Priscillianists. V. *The Acts of St Andrew*; received by the Manichæans, Encratites, and Apotactics. VI. *The Acts of St Thomas the Apostle*; received particularly by the Manichæans. VII. *The Acts of St Philip*. This book the Gnostics made use of. VIII. *The Acts of St Matthias*. Some have imagined that the Jews for a long time had concealed the original acts of the life and death of St Matthias written in Hebrew; and that a monk of the abbey of St Matthias at Treves, having got them out of their hands, procured them to be translated into Latin, and published them; but the critics will not allow them to be authentic.

Acts of Pilate; a relation sent by Pilate to the emperor Tiberius, concerning Jesus Christ, his death, resurrection, ascension, and the crimes of which he was convicted before him†. It was a custom among the Romans, that the proconsuls and governors of provinces should draw up acts, or memoirs, of what happened in the course of their government, and send them to the emperor and senate. The genuine *acts* of Pilate were sent by him to Tiberius, who reported them to the senate; but they were rejected by that assembly, because not immediately addressed to them: as is testified by Tertullian, in his *Apol.* cap. 5. and 20, 21. The heretics forged acts in imitation of them: in the reign of the emperor Maximin, the Gentiles, to throw an odium on the Christian name, spread about spurious Acts of Pilate; which the emperor, by a solemn edict, ordered to be sent into all the provinces of the empire, and enjoined the school-masters to teach and explain them to their scholars, and make them learn them by heart. These acts, both the genuine and the spurious, are lost. There is indeed extant, in the Pseudo-Hegeppus, a letter from Pilate to the emperor Claudius, concerning Jesus Christ‡; but it discovers itself at first sight not to be authentic.

† Eusebii
Hist. Eccl. lib. ii. cap. 2.
and ix. 5.

‡ Cave Hist.
Literar.
Sæc. Apostol.

Act of Parliament is a positive law, consisting of two parts, the words of the act, and its true sense and meaning; which being joined, make the law. The words of acts of parliament should be taken in a lawful sense. Cases of the same nature are within the inten-

tion, though without the letter, of the act; and some acts extend by equity to things not mentioned therein. See PARLIAMENT.

Actæ.

Actæa.

ACTÆ, were meadows of remarkable verdure and luxuriancy near the sea-shore, where the Romans used to indulge themselves to a great degree in softness and delicacy of living. The word is used in this sense by Cicero and Virgil; but Vossius thinks it can only be used in speaking of Sicily, as these two authors did.

ACTÆA, ACONITUM RACEMOSUM, HERB CRISTOPHER, or BANE-BERRIES; a genus of the monogynia order, belonging to the polyandria class of plants. The characters are: The *calyx* is a perianthium consisting of four roundish, obtuse, concave leaves, which fall off. The *corolla* consists of four petals, larger than the calyx, pointed at both ends, and falling off. The *stamina* consist of numerous capillary filaments; the antheræ are roundish, erect, and didymous. The *pistillum* has an ovate germen; no stylus; the stigma thickish and obliquely depressed. The *pericarpium* is an oval smooth one-furrow'd one-cell'd berry. The *seeds* are very numerous, semiorbicular, and incumbent in a double order.—This genus is associated with the *Multifiliqueæ*, the 26th natural order. There are four

Species and properties. 1. The *spicata*, or common herb-christopher, is a native in several parts of Britain. It grows to the height of about two feet and an half; the foot-stalks of the leaves arise from the root; these divide into three smaller foot-stalks, each of which are again divided into three, and these have each three lobes; so that each leaf is composed of 27 lobes or smaller leaves. The flowers grow in ramous spikes, and are of a pure white: they are borne upon a slender, jointed, and furrowed stem; appear in May; and are succeeded by black, shining, pulpy berries, about the size of peas, which ripen in the autumn. This plant is a powerful repellent, and the root has been used internally in some nervous cases, but must be administered with caution. The berries are highly poisonous. It is said toads resort to this plant, on account of its fetid smell. Sheep and goats eat it; cows, horses, and swine, refuse it. 2. The *alba*, or American herb-christopher, is a native of North America. The leaves of this species are somewhat like the former, but not so deeply indented in the edges. The flowers grow in a more compact spike, and the berries are very white and transparent when ripe; the roots are composed of thick knobs. This species has been used as an emetic, and sometimes called *ipecacuanha*. 3. The *Racemosa*, or American black or wild snakeroot, is likewise a native of North America. It has large compound leaves, rising immediately from the root, and branched after the same manner as the first, which grow more than two feet high. The flower-stem rises to the height of four or five feet; and carries a long spike of white flowers reflexed at the top. These appear in June or the beginning of July, but the seeds do not come to maturity in Britain. The root of this plant is greatly used by physicians in North America, in many disorders; and is supposed to be an antidote against poison, or the biting of a rattle-snake. 4. The *cimicifuga*, is a native of Siberia; the leaves resemble those of the feathered columbine; the stalks rise little more than a foot high, supporting particles of white flowers, which appear in May. This species is rare in Britain.

Actæon

||
Actinia.

Culture. The first species hath a perennial root, but the stalks annually decay. It may be propagated either by seeds, or parting the roots, which should be transplanted in autumn. The seeds should be sown soon after they are ripe, or they will lie a whole year in the ground before they vegetate. They should be sown in a shady border; and as all the plants do not come up at the same time, the border should not be disturbed till the following autumn, when they should be transplanted into a shady border, where they may be allowed to remain and flower.—The second species may be propagated in the same manner; only the plants should be allowed three feet every way, on account of their wide-spreading leaves. This species delights in a light moist soil, and a shady situation.—The third is usually propagated by seeds sent annually from North America: it thrives in the same kind of soil as the former; and is very hardy, requiring no other culture than the common flowering shrubs. The plants should not be often removed, for that will prevent their flowering strong.—The fourth requires a moist loamy soil, and shady situation. It may be propagated in the same manner as the others.

ACTÆON, in fabulous history, the son of Aristæus and Autonoe; a great hunter. He was turned by Diana into a stag, for looking on her while bathing; and died by his own dogs.

ACTANIA, an island, according to Pliny, in the North sea. It lies to the west of Holstein and Dithmarsch, not far from the mouth of the Eyder and Elbe, and is now called *Heyligland*.

ACTE. See *SAMBUCUS*.

ACTIAN GAMES, in Roman antiquity, were solemn games instituted by Augustus, in memory of his victory over Marc Anthony at Actium, held every fifth year, and celebrated in honour of Apollo, since called *Actius*. Hence *Actian Years*, an æra commencing from the battle of Actium, called the *Æra of Augustus*.

Virgil insinuates them to have been instituted by Æneas; from that passage *Æn.* III. v. 280.

Actiaque Iliacis celebramus littora ludis.

Æn. iii. 250.

But this he only does by way of compliment to Augustus: attributing that to the hero from whom he descended, which was done by the emperor himself: as is observed by Servius.

ACTINIA, in zoology, a genus belonging to the order of vermes mollusca. The body is oblong and smooth, attaching itself firmly by its basis to rocks or other solid substances, having a dilatable apex hooked within. The mouth is furnished with crooked teeth, the rostrum cylindrical and radiated. There are five species, some of which make a beautiful appearance, and are called *Animal Flowers*, *Sea Anemonies*, and *Urtica Marina*. See *ANIMAL Flower*.

Progressive motion in these creatures is so slow, that it is difficult to perceive any, as they scarce advance the length of one inch in an hour. It would seem they do not all produce, when handled, the painful sensation which had acquired them the name of *sea-nettles*.—They are viviparous, feed on shell fish, open their mouth more or less according to the size of the prey they have to deal with, and then reject the shell through the same aperture. When the mouth is open, all the tentacula of the actinia may be seen, resembling in that situation

a full-blown flower, which has given it the denomination of the *flower fish*.

Actio.

ACTIO, in Roman antiquities, an action at law in a court of justice. The formalities used by the Romans, in judicial actions, were these: If the difference failed to be made up by friends, the injured person proceeded *in jus reum vocare*, to summon the offending party to the court, who was obliged to go, or give bond for his appearance.

The offending party might be summoned into court *viva voce*, by the plaintiff himself meeting the defendant, declaring his intention to him, and commanding him to go before the magistrate and make his defence. If he would not go willingly, he might drag and force him along, unless he gave security for his appearance on some appointed day. If he failed to appear on the day agreed on, then the plaintiff, whensoever he met him, might take him along with him by force, calling any by-standers to bear witness, by asking them *visne antestari*; the by-standers upon this turned their ear towards him in token of their consent: To this Horace alludes in his Sat. against the impertinent, Lib. i. Sat. 9. See this further explained under the article *ANTESTARI*.

Both parties being met before the prætor, or other supreme magistrate presiding in the court, the plaintiff proposed the action to the defendant; in which he designed to prosecute him. This they termed *edere actionem*; and was commonly performed by writing it in a tablet, and offering it to the defendant, that he might see whether he had better stand the suit or compound.

In the next place came the *postulatio actionis*, or the plaintiff's petition to the prætor, for leave to prosecute the defendant in such an action. The petition was granted by writing at the bottom of it *actionem do*, or refused by writing in the same manner *actionem non do*.

The petition being granted, the plaintiff *vadabatur reum*, i. e. obliged him to give sureties for his appearance on such a day in the court; and this was all that was done in public, before the day fixed upon for the trial.

In the mean time, the difference was often made up, either *transfatione*, by letting the cause fall as dubious; or *pactione*, by composition for damages amongst friends.

On the day appointed for hearing, the prætor ordered the several bills to be read, and the parties summoned by an *accensus*, or beadle. See *ACCENSI*.

Upon the non-appearance of either party, the defaulter lost his cause;—if they both appeared, they were said *se stetisse*; and then the plaintiff proceeded *litem sive actionem intendere*, i. e. to prefer his suit, which was done in a set form of words, varying according to the difference of the actions. After this the plaintiff desired judgment of the prætor, that is, to be allowed a *judex* or *arbiter*, or else the *recuperatores* or *centumviri*. These he requested for the hearing and deciding the business; but none of them could be desired but by the consent of both parties.

The prætor having assigned them their judges, defined and determined the number of witnesses to be admitted, to hinder the protracting of the suit; and then the parties proceeded to give their caution, that the

Action. the judgment, whatever it was, should stand and be performed on both sides. The judges took a solemn oath to be impartial; and the parties took the *juramentum calumnie*. Then the trial began with the assistance of witnesses, writings, &c. which was called *disceptatio causa*.

ACTION, in a general sense, implies nearly the same thing with *Act*.—Grammarians, however, observe some distinction between *action* and *act*; the former being generally restricted to the common or ordinary transactions, whereas the latter is used to express those which are remarkable. Thus, we say it is a good *action* to comfort the unhappy; it is a generous *act* to deprive ourselves of what is necessary for their sake. The wise man proposes to himself an honest end in all his *actions*; a prince ought to mark every day of his life with some *act* of greatness. The Abbé Girard makes a further distinction between the words *action* and *act*. The former, according to him, has more relation to the power that acts than the latter; whereas the latter has more relation to the effect produced than the former: and hence the one is properly the attribute of the other. Thus we may properly say, "Be sure to preserve a presence of mind in all your actions; and take care that they be all acts of equity."

ACTION, in mechanics, implies either the effort which a body or power makes against another body or power, or the effect itself of that effort.

As it is necessary in works of this kind to have a particular regard to the common language of mechanics and philosophers, we have given this double definition: but the proper signification of the term is the motion which a body really produces, or tends to produce, in another; that is, such is the motion it would have produced, had nothing hindered its effect.

All power is nothing more than a body actually in motion, or which tends to move itself; that is, a body which would move itself if nothing opposed it. The action therefore of a body is rendered evident to us by its motion only; and consequently we must not fix any other idea to the word action, than that of actual motion, or a simple tendency to motion. The famous question relating to *vis viva*, and *vis mortua*, owes, in all probability, its existence to an inadequate idea of the word action; for had Leibnitz and his followers observed, that the only precise and distinct idea we can give to the word force or action, reduces it to its effect, that is, to the motion it actually produces or tends to produce, they would never have made that curious distinction.

Quantity of Action, a name given by M. de Maupertuis, in the Memoires of the Parisian Academy of Sciences for 1744, and those of Berlin for 1746, to the product of the mass of a body by the space which it runs through, and by its celerity. He lays it down as a general law, "that, in the changes made in the state of a body, the quantity of action necessary to produce such change, is the least possible." This principle he applies to the investigation of the laws of refraction, of equilibrium, &c. and even to the ways of acting employed by the Supreme Being. In this manner M. de Maupertuis attempts to connect the metaphysics of final causes with the fundamental truths of mechanics, to show the dependence of the collision of both elastic and hard bodies upon one and the same law,

which before had always been referred to separate laws; and to reduce the laws of motion, and those of equilibrium, to one and the same principle.

ACTION, in ethics, denotes the external signs or expressions of the sentiments of a moral agent. See *Active Power*, *infra*.

ACTION, in poetry, the same with subject or fable. Critics generally distinguish two kinds, the principal and the incidental. The principal action is what is generally called the *fable*; and the incidental an *episode*. See *POETRY*, Part II.

ACTION, in oratory, is the outward deportment of the orator, or the accommodation of his countenance, voice, and gesture, to the subject of which he is treating. See *ORATORY*, Part IV.

ACTION, in a theatrical sense. See *DECLAMATION*, Art. IV.

Action for the Pulpit. See *DECLAMATION*, Art. I.

ACTION, in painting and sculpture, is the attitude or position of the several parts of the face, body, and limbs of such figures as are represented, and whereby they seem to be really actuated by passions. Thus we say, the action of such a figure finely expresses the passions with which it is agitated: we also use the same expression with regard to animals.

ACTION, in physiology, is applied to the functions of the body, whether vital, animal, or natural.

The *vital* functions, or actions, are those which are absolutely necessary to life, and without which there is no life, as the action of the heart, lungs, and arteries. On the action and reaction of the solids and fluids on each other, depend the vital functions. The pulse and respiration are the external signs of life. Vital diseases are all those which hinder the influx of the venous blood into the cavities of the heart, and the expulsion of the arterial blood from the same.—The *natural* functions are those which are instrumental in repairing the several losses which the body sustains; for life is destructive of itself, its very offices occasioning a perpetual waste. The manducation of food, the deglutition and digestion thereof, also the separation and distribution of the chyle and excrementitious parts, &c. are under the head of natural functions, as by these our aliment is converted into our nature. They are necessary to the continuance of our bodies.—The *animal* functions are those which we perform at will, as muscular motion, and all the voluntary actions of the body: they are those which constitute the senses of touch, taste, smell, sight, hearing; perception, reasoning, imagination, memory, judgment, affections of the mind. Without any, or all of them, a man may live, but not so comfortably as with them.

ACTION, in commerce, is a term used abroad for a certain part or share of a public company's capital stock. Thus, if a company has 400,000 livres capital stock, this may be divided into 400 actions, each consisting of 1000 livres. Hence a man is said to have two, four, &c. actions, according as he has the property of two, four, &c. 1000 livres capital stock. The transferring of actions abroad is performed much in the same manner as stocks are with us. See *STOCKS*.

ACTION, in law, is a demand made before a judge for obtaining what we are legally intitled to demand, and is more commonly known by the name of *law-suit* or *process*. See *SUIT*.

ACTIONARY,

Dictionary
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Action.

ACTIONARY, or **ACTIONIST**, a proprietor of stock in a trading company.

ACTIONS, among merchants, sometimes signify moveable effects; and we say the merchant's creditors have seized on all his actions, when we mean that they have taken possession of all his active debts.

ACTIVE, denotes something that communicates action or motion to another; in which acceptation it stands opposed to passive.

ACTIVE, in grammar, is applied to such words as express action; and is therefore opposed to passive. The active performs the action, as the passive receives it. Thus we say, a verb *active*, a conjugation *active*, &c. or an *active* participle.

Active Verbs, are such as do not only signify doing, or acting, but have also nouns following them, to be the subject of the action or impression: Thus, *To love*, *to teach*, are verbs *active*; because we can say, *To love a thing*, *to teach a man*. Neuter verbs also denote an action, but are distinguished from active verbs, in that they cannot have a noun following them: such are, *To sleep*, *to go*, &c.—Some grammarians, however, make three kinds of active verbs: the *transitive*, where the action passes into a subject different from the agent; *reflected*, where the action returns upon the agent; and *reciprocal*, where the action turns mutually upon the two agents who produced it.

* Dr Reid
on the Ac-
tive Powers
of Man,
p. 12.

ACTIVE Power, in metaphysics, the power of executing any work or labour; in contradistinction to *speculative powers**, or the powers of seeing, hearing, remembering, judging, reasoning, &c.

The exertion of active power we call *action*; and as every action produces some change, so every change must be caused by some effect, or by the cessation of some exertion of power. That which produces a change by the exertion of its power, we call the *cause* of that change; and the change produced, the *effect* of that cause. See **METAPHYSICS**.

ACTIVE Principles, in chemistry, such as are supposed to act without any assistance from others; as mercury, sulphur, &c.

ACTIVITY, in general, denotes the power of acting, or the active faculty. See **ACTIVE**.

Sphere of ACTIVITY, the whole space in which the virtue, power, or influence, of any object is exerted.

ACTIUM (anc. geog.), a town situated on the coast of Acarnania, in itself inconsiderable, but famous for a temple of Apollo, a safe harbour, and an adjoining promontory of the same name, in the mouth of the Sinus Ambracius, over against Nicopolis, on the other side of the bay: it afterwards became more famous on account of Augustus's victory over Antony and Cleopatra; and for quinquennial games instituted there, called *Actia* or *Ludi Actiaci*. Hence the epithet *Actius*, given to Apollo (Virgil). *Actiaca æra*, a computation of time from the battle of Actium. The promontory is now called *Capo di Figalo*.

ACTIUS, in mythology, a surname of Apollo, from Actium, where he was worshipped.

ACTON, a town near London, where is a well that affords a purging water, which is noted for the pungency of its salt. This water is whitish, to the taste it is sweetish, with a mixture of the same bitter which is in the Epsom water. The salt of this water is not quite so soft as that of Epsom; and is more calcareous than

it, being more of the nature of the salt of lime: for a quantity of the Acton water being boiled high, on being mixed with a solution of sublimate in pure water, threw down a yellow sediment. The salt of the Acton water is more nitrous than that of Epsom; it strikes a deep red, or purple, with the tincture of logwood in brandy, as is usual with nitrous salts; it does not precipitate silver out of the spirit of nitre, as common salt does: 1½ lb. of this water yields 48 grains of salt.

ACTOR, in general, signifies a person who acts or performs something.

ACTOR, among civilians, the proctor or advocate in civil courts or causes; as, *Actor ecclesiæ* has been sometimes used for the advocate of the church; *actor dominicus* for the lord's attorney; *actor villæ*, the steward or head bailiff of a village.

ACTOR, in the drama, is a person who represents some part or character upon the theatre. The drama consisted originally of nothing more than a simple chorus, who sung hymns in honour of Bacchus; so that the primitive actors were only singers and musicians. Thespis was the first that, in order to ease this unformed chorus, introduced a declaimer, who repeated some heroic or comic adventure. Æschylus, finding a single person tiresome, attempted to introduce a second, and changed the ancient recitals into dialogues. He also dressed his actors in a more majestic manner, and introduced the cothurnus or buskin. Sophocles added a third, in order to represent the various incidents in a more natural manner: and here the Greeks stopped, at least we do not find in any of their tragedies above three persons in the same scene. Perhaps they looked upon it as a rule of the dramatic poem, never to admit more than three speakers at a time on the stage; a rule which Horace has expressed in the following verse:

Nec quarta loqui persona laboret.

This, however, did not prevent their increasing the number of actors in comedy. Before the opening of a play, they named their actors in full theatre, together with the parts they were to perform. The ancient actors were masked, and obliged to raise their voice extremely, in order to make themselves heard by the innumerable crowd of people who filled the amphitheatres: they were accompanied with a player on the flute, who played a prelude, gave them the tone, and played while they declaimed. Horace speaks of a kind of secondary actors in his time, whose business was to imitate the first; and lessen themselves, to become better foils to their principals.

The moderns have introduced an infinite number of actors upon the stage. This heightens the trouble and distress that should reign there, and makes a diversity, in which the spectator is sure to be interested.

Actors were highly honoured at Athens. At Rome they were despised, and not only denied all rank among the citizens, but even when any citizen appeared upon the stage, he was expelled his tribe and deprived of the right of suffrage by censors. Cicero, indeed, esteems the talents of Roscius: but he values his virtues still more; virtues which distinguished him so remarkably above all others of his profession, that they seemed to have excluded him from the theatre. The French have, in this respect, adopted the ideas of the Romans; and the English those of the Greeks.

ACTOR, the name of several persons in fabulous history.

Actor.

Actorum story. One *Actor* among the Aurunci is described by Virgil as an hero of the first rank. *Æn.* xii.

Actuariæ. ACTORUM TABULÆ, in antiquity, were tables instituted by Servius Tullius, in which the births of children were registered. They were kept in the treasury of Saturnus.

ACTRESS, in a general sense, a female who acts or performs something.

ACTRESS, in the drama, a female performer. Women actors were unknown to the ancients, among whom men always performed the female character; and hence one reason for the use of masks among them.

Actresses are said not to have been introduced on the English stage till after the restoration of King Charles II. who has been charged with contributing to the corruption of our manners by importing this usage from abroad. But this can be but partly true: the queen of James I. acted a part in a pastoral; and Prynne, in his *Histriomastix*, speaks of women actors in his time as whores; which was one occasion of the severe prosecution brought against him for that book.

There are some very agreeable and beautiful talents, of which the possession commands a certain sort of admiration; but of which the exercise for the sake of gain is considered, whether from reason or prejudice, as a sort of public prostitution. The pecuniary recompence, therefore, of those who exercise them in this manner, must be sufficient, not only to pay for the time, labour, and expence of acquiring the talents, but for the discredit which attends the employment of them as the means of subsistence. The exorbitant rewards of players, opera-fingers, opera-dancers, &c. are founded upon those two principles; the rarity and beauty of the talents, and the discredit of employing them in this manner. It seems absurd at first sight that we should despise their persons, and yet reward their talents with the most profuse liberality. While we do the one, however, we must of necessity do the other. Should the public opinion or prejudice ever alter with regard to such occupations, their pecuniary recompence would quickly diminish. More people would apply to them, and the competition would quickly reduce the price of their labour. Such talents, though far from being common, are by no means so rare as is imagined. Many people possess them in great perfection, who disdain to make this use of them; and many more are capable of acquiring them, if any thing could be made honourably by them.

ACTUAL, something that is real and effective, or that exists truly and absolutely. Thus philosophers use the terms *actual* heat, *actual* cold, &c. in opposition to *virtual* or *potential*. Hence, among physicians, a red-hot iron, or fire, is called an actual cautery; in distinction from cauteries, or caustics, that have the power of producing the same effect upon the animal solids as actual fire, and are called *potential* cauteries. Boiling water is actually hot; brandy, producing heat in the body, is potentially hot, though of itself cold.

ACTUAL Sin, that which is committed by the person himself; in opposition to *original* sin, or that which he contracted from being a child of Adam.

ACTUARIÆ NAVES, a kind of ships among the Romans, chiefly designed for swift sailing.

ACTUARIUS, a celebrated Greek physician of the 13th century, and the first Greek author who has treated of mild purgatives, such as cassia, manna, senna, &c. His works were printed in one volume folio, by Henry Stephens, in 1567.

ACTUARIUS, or ACTARIUS, a notary or officer appointed to write the acts or proceedings of a court, or the like. In the Eastern Empire, the actuarii were properly officers who kept the military accounts, received the corn from the *susceptores* or store-keepers, and delivered it to the soldiers.

ACTUATE, to bring into act, or put a thing in action. Thus an agent is said, by the schoolmen, to *actuate* a power, when it produces an act in a subject. And thus the mind may be said to *actuate* the body.

ACTUS, in ancient architecture, a measure in length equal to 120 Roman feet. In ancient agriculture, the word signified the length of one furrow, or the distance a plough goes before it turns.

Actus Minimus, was a quantity of land 120 feet in length, and four in breadth.

Actus Major, or *Actus Quadratus*, a piece of ground in a square form, whose side was equal to 120 feet, equal to half the jugerum.

Actus Intervicinalis, a space of ground four feet in breadth, left between the lands as a path or way.

ACUANITES, in ecclesiastical history, the same with those called more frequently MANICHEES. They took the name from Acua, a disciple of Thomas one of the twelve apostles.

ACULEATE, or ACULEATI, a term applied to any plant or animal armed with prickles.

ACULEI, the prickles of animals or of plants.

ACULER, in the manege, is used for the motion of a horse, when, in working upon volts, he does not go far enough forward at every time or motion, so that his shoulders embrace or take in too little ground, and his croupe comes too near the centre of the volt. Horses are naturally inclined to this fault in making demi-volts.

ACUMINA, in antiquity, a kind of military omen, most generally supposed to have been taken from the points or edges of darts, swords, or other weapons.

ACUNA (Christopher de), a Spanish Jesuit, born at Burgos. He was admitted into the society in 1612, being then but 15 years of age. After having devoted some years to study, he went to America, where he assisted in making converts in Chili and Peru. In 1640, he returned to Spain, and gave the king an account how far he had succeeded in the commission he had received to make discoveries on the river of the Amazons; and the year following he published a description of this river at Madrid. Acuna was sent to Rome, as procurator of his province. He returned to Spain with the title of Qualificator of the Inquisition; but soon after embarked again for the West Indies, and was at Lima in 1675, when Father Southwell published at Rome the *Bibliothèque* of the Jesuit writers. Acuna's work is intitled, *Nuevo descubrimiento del gran río de las Amazonas*; i.e. "A new discovery of the great river of the Amazons." He was ten months together upon this river, having had instructions to inquire into every thing with the greatest exactness, that his majesty might thereby be enabled to render the navigation more

Acupunc-
ture
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Ad.

more easy and commodious. He went aboard a ship at Quito with Peter Texiera, who had already been so far up the river, and was therefore thought a proper person to accompany him in this expedition. They embarked in February 1639, but did not arrive at Para till the December following. It is thought that the revolutions of Portugal, by which the Spaniards lost all Brasil, and the colony of Para at the mouth of the river of the Amazons, were the cause that the relation of this Jesuit was suppressed; for as it could not be of any advantage to the Spaniards, they were afraid it might prove of great service to the Portuguese. The copies of this work became extremely scarce, so that the publishers of the French translation at Paris asserted, that there was not one copy of the original extant, excepting one in the possession of the translator, and perhaps that in the Vatican library. M. de Gomberville was the author of this translation: it was published after his death, with a long dissertation. An account of the original may be seen in the Paris Journal, in that of Leipzig, and in Chevereau's History of the World.

ACUPUNCTURE, the name of a surgical operation among the Chinese and Japanese, which is performed by pricking the part affected with a silver needle. They employ this operation in headaches, lethargies, convulsions, colics, &c.

ACUS, in ichthyology, the trivial name of a species of syngnathus. See **SYNGNATHUS**.

ACUSIO COLONIA, now **ANCONE**, according to Holstenius, between Orange and Valence, near Montelimart, on the banks of the Rhone.

ACUTE, an epithet applied to such things as terminate in a sharp point or edge. And in this sense it stands opposed to obtuse.

Acute Angle, in geometry, is that which is less than a right angle, or which does not subtend 90 degrees.

Acute-angled Triangle, is a triangle whose three angles are all acute.

Acute-angled Cone is, according to the ancients, a right cone, whose axis makes an acute angle with its side.

ACUTE, in music, is applied to a sound or tone that is sharp or high, in comparison of some other tone. In this sense, *acute* stands opposed to *grave*.

Acute Accent. See **ACCENT**.

Acute Diseases, such as come suddenly to a crisis. This term is used for all diseases which do not fall under the head of chronic diseases.

ACUTIATOR, in writers of the barbarous ages, denotes a person that whets or grinds cutting instruments; called also in ancient glossaries, *acutor*, *ακοντης*, *famarius*, *cobarius*, &c. In the ancient armies there were accutiatores, a kind of smiths, retained for whetting or keeping the arms sharp.

AD, a Latin preposition, originally signifying *to*, and frequently used in composition both with and without the *d*, to express the relation of one thing to another.

Ad Bestias, in antiquity, is the punishment of criminals condemned to be thrown to wild beasts.

Ad Hominem, in logic, a kind of argument drawn from the principles or prejudices of those with whom we argue.

N^o 3.

Ad Ludos, in antiquity, a sentence upon criminals among the Romans, whereby they were condemned to entertain the people by fighting either with wild beasts, or with one another, and thus executing justice upon themselves.

Ad Metalla, in antiquity, the punishment of such criminals as were condemned to the mines, among the Romans; and therefore called *Metallici*.

Ad Valorem, a term chiefly used in speaking of the duties or customs paid for certain goods: The duties on some articles are paid by the number, weight, measure, tale, &c.; and others are paid *ad valorem*, that is, according to their value.

ADAGE, a proverb, or short sentence, containing some wise observation or popular saying. Erasmus has made a very large and valuable collection of the Greek and Roman adages; and Mr Ray has done the same with regard to the English. We have also Kelly's Collection of Scots Proverbs.

ADAGIO, in music. Adverbially, it signifies *softly*, *leisurely*; and is used to denote the slowest of all times. Used substantively, it signifies a slow movement. Sometimes this word is repeated, as *adagio*, *adagio*, to denote a still greater retardation in the time of the music.

ADALIDES, in the Spanish policy, are officers of justice, for matters touching the military forces. In the laws of king Alphonfus, the adalides are spoken of as officers appointed to guide and direct the marching of the forces in time of war. Lopez represents them as a sort of judges, who take cognizance of the differences arising upon excursions, the distribution of plunder, &c.

ADAM, the first of the human race, was formed by the Almighty on the sixth day of the creation. His body was made of the dust of the earth; after which, God animated or gave it life, and Adam then became a rational creature.—His heavenly Parent did not leave his offspring in a destitute state to shift for himself; but planted a garden, in which he caused to grow not only every tree that was proper for producing food, but likewise such as were agreeable to the eye, or merely ornamental. In this garden were assembled all the brute creation; and, by their Maker, caused to pass before Adam, who gave all of them names, which were judged proper by the Deity himself.—In this review, Adam found none for a companion to himself. This solitary state was seen by the Deity to be attended with some degree of unhappiness; and therefore he threw Adam into a deep sleep, in which condition he took a rib from his side, and healing up the wound formed a woman of the rib he had taken out. On Adam's awaking, the woman was brought to him; and he immediately knew her to be one of his own species, called her his bone and his flesh, giving her the name of *woman* because she was taken out of man.

The first pair being thus created, God gave them authority over the inferior creation, commanding them to subdue the earth, also to increase and multiply and fill it. They were informed of the proper food for the beasts and for them; the grass, or green herbs, being appointed for beasts; and fruits, or seeds, for man. Their proper employment also was assigned them; namely, *to dress the garden, and to keep it*.

Though Adam was thus highly favoured and instructed

Ad
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Adam.

Adam. ted by his Maker, there was a single tree, which grew in the middle of the garden, of the fruit of which they were not allowed to eat; being told, that they should surely die in the day they eat of it. This tree was named, *the Tree of the Knowledge of Good and Evil*. This prohibition, however, they soon broke through. The woman having entered into conversation with the *Serpent*, was by him persuaded, that by eating of the tree she should become as wise as God himself; and accordingly, being invited by the beauty of the fruit, and its desirable property of imparting wisdom, she plucked and eat; giving her husband of it at the same time, who did likewise eat.

Before this transgression of the divine command, Adam and his wife had no occasion for clothes, neither had they any sense of shame; but immediately on eating the forbidden fruit, they were ashamed of being naked, and made aprons of fig-leaves for themselves. On hearing the voice of God in the garden, they were terrified, and hid themselves: but being questioned by the Deity, they confessed what they had done, and received sentence accordingly; the man being condemned to labour; the woman to subjection to her husband, and to pain in child-bearing. They were now driven out of the garden, and their access to it prevented by a terrible apparition. They had clothes given them by the Deity made of the skins of beasts. In this state Adam had several children; the names of only three of whom we are acquainted with, *viz.* Cain, Abel, and Seth. He died at the age of 930 years.

These are all the particulars concerning Adam's life, that we have on divine authority: but a vast multitude of others are added by the Jews, Mahometans, and Papists; all of which must be at best conjectural; most of them, indeed, appear downright falsehoods or absurdities. The curiosity of our readers, it is presumed, will be sufficiently gratified by the few which are here subjoined.

According to the Talmudists, when Adam was created, his body was of immense magnitude. When he sinned, his stature was reduced to an hundred ells, according to some; to nine hundred cubits, according to others; who think this was done at the request of the angels, who were afraid of so gigantic a creature. In the island of Ceylon is a mountain, called the *Peak* or mountain of Adam, from its being, according to the tradition of the country, the residence of our first parent. Here the print of his footsteps, above two palms in length, are still pointed out.

Many reveries have been formed concerning the personal beauty of Adam. That he was a handsome well-shaped man is probable; but some writers, not content with this, affirm, that God, intending to create man, clothed Himself with a perfectly beautiful human body, making this his model in the formation of the body of Adam.

Nor has the imagination been less indulged concerning the formation of the human species male and female.—It would be endless to recount all the whimsies that have been wrote on this subject; but as Mad. Bourignon has made a considerable figure in the *religious*, or rather *superstitious* world, we cannot help inserting some of her opinions concerning the first man, which are peculiarly marvellous. According to the *revelations* of this lady, Adam before his fall possessed in himself the principles of both sexes, and the vir-

Vol. I. Part I.

tue or power of producing his like, without the concurrent assistance of woman. The division into two sexes, she imagined*, was a consequence of man's sin; * Preface to and now, she observes, mankind are become so many a book intitled, *Le nouveau ciel et la nouvelle terre*, Amst. 1679. *monsters in nature*, being much less perfect in this respect than plants or trees, who are capable of producing their like alone, and without pain or misery. She even imagined, that being in an ecstasy, she saw the figure of Adam before he fell, with the manner how, by himself, he was capable of procreating other men. "God," says she, "represented to my mind the beauty of the first world, and the manner how he had drawn it from the chaos: every thing was bright, transparent, and darted forth light and ineffable glory. The body of Adam was purer and more transparent than crystal, and vastly fleet; through this body were seen vessels and rivulets of light, which penetrated from the inward to the outward parts, through all his pores. In some vessels ran fluids of all kinds and colours, vastly bright, and quite diaphanous. The most ravishing harmony arose from every motion; and nothing resisted, or could annoy, him. His stature was taller than the present race of men; his hair was short, curled, and of a colour inclining to black; his upper lip covered with short hair: and instead of the bestial parts which modesty will not allow us to name, he was fashioned as our bodies will be in the life eternal, which I know not whether I dare reveal. In that *region* his nose was formed after the manner of a *face*, which diffused the most delicious fragrancy and perfumes; whence also men were to issue, all whose principles were inherent in him; there being in his belly a vessel, where little eggs were formed; and a second vessel filled with a fluid, which impregnated those eggs: and when man heated himself in the love of God, the desire he had that other creatures should exist besides himself, to praise and love God, caused the fluid abovementioned (by means of the fire of the love of God) to drop on one or more of these eggs, with inexpressible delight; which being thus impregnated, issued, some time after, out of man, by this canal†, in the shape of an egg, whence a perfect man † *i. e.* the *nasal canal*, was hatched by insensible degrees. Woman was formed by taking out of Adam's sides the vessels that contained the eggs; which she still possesses, as is discovered by anatomists." *situated as above described.*

Many others have believed, that Adam at his first creation was both male and female: others, that he had two bodies joining together at the shoulders, and their faces looking opposite ways like those of Janus. Hence, say these, when God created Eve, he had no more to do than to separate the two bodies from one another ‡. ‡ See *Androgynes*. Of all others, however, the opinion of Paracelsus seems the most ridiculous ||. *Negabat primos parentes ante lapsum habuisse partes generationi hominis necessarias; cre-* || Paracelsus *debat postea accessisse, ut strumam gutturi.* *apud Vossium de philosophia, c. ix. p. 71.*

Extravagant things are asserted concerning Adam's knowledge. It is very probable that he was instructed by the Deity how to accomplish the work appointed him, *viz.* to dress the garden, and keep it from being destroyed by the brute creatures; and it is also probable that he had likewise every piece of knowledge communicated to him that was either necessary or pleasing: but that he was acquainted with geometry, mathematics, rhetoric, poetry, painting, sculpture, &c. is too ridiculous to be credited by any sober person. Some rabbies,

Adam. rabbies, indeed, have contented themselves with equaling Adam's knowledge to that of Moses and Solomon; while others, again, have maintained that he excelled the angels themselves. Several Christians seem to be little behind the Jews in the degree of knowledge they ascribed to Adam; nothing being hid from him, according to them, except contingent events relating to futurity. One writer indeed (Pinedo) excepts politics; but a Carthusian friar, having exhausted in favour of Aristotle, every image and comparison he could think of, at last asserted that Aristotle's knowledge was as extensive as that of Adam.—In consequence of this surprising knowledge with which Adam was endued, he is supposed to have been a considerable author. The Jews pretend that he wrote a book on the creation, and another on the Deity. Some rabbies ascribe the 92d psalm to Adam; and in some manuscripts the Chaldee title of this psalm expressly declares that this is the song of praise which the first man repeated for the sabbath-day.

Various conjectures have been formed concerning the place where man was first created, and where the garden of Eden was situated; but none of these have any solid foundation. The Jews tell us, that Eden was separated from the rest of the world by the ocean; and that Adam, being banished therefrom, walked across the sea, which he found every way fordable, by reason

* This is of his enormous stature *. The Arabians imagined paradise to have been in the air; and that our first parents were thrown down from it on their transgression, as Vulcan is said to have been thrown down headlong from heaven by Jupiter.

Strange stories are told concerning Adam's children. That he had none in the state of innocence, is certain from scripture; but that his marriage with Eve was not consummated till after the fall, cannot be proved from thence. Some imagine, that, for many years after the fall, Adam denied himself the connubial joys by way of penance; others, that he cohabited with another woman, whose name was LILITH. The Mahometans tell us, that our first parents having been thrown headlong from the celestial paradise, Adam fell upon the isle of Serendib, or Cylon, in the East-Indies; and Eve on Iodda, a port of the Red Sea, not far from Mecca. After a separation of upwards of 200 years, they met in Cylon, where they multiplied: according to some Eve had twenty, according to others only eight, deliveries; bringing forth at each time twins, a male and a female, who afterwards married. The Rabbins imagine that Eve brought forth Cain and Abel at a birth; that Adam wept for Abel an hundred years in the valley of tears near Hebron, during which time he did not cohabit with his wife; and that this separation would probably have continued longer, had it not been forbid by the angel Gabriel. The inhabitants of Cylon affirm, that the salt lake on the mountain of Colombo consists wholly of the tears which Eve for one hundred years together shed because of Abel's death.

Some of the Arabians tell us, that Adam was buried near Mecca on Mount Abukobeis; others, that Noah, having laid his body in the ark, caused it to be carried after the deluge to Jerusalem by Melchisedek the son of Shem: of this opinion are the eastern Christians; but the Persians affirm that he was interred in the isle of Serendib, where his corps was guarded by

lions at the time the giants warred upon one another.— St Jerom imagined that Adam was buried at Hebron; others, on Mount Calvary. Some are of opinion that he died on the very spot where Jerusalem was afterwards built; and was buried on the place where Christ suffered, that so his bones might be sprinkled with the Saviour's blood!!!

ADAM (Melchior) lived in the 17th century. He was born in the territory of Grotkaw in Silesia, and educated in the college of Brieg, where the dukes of that name, to the utmost of their power, encouraged learning and the reformed religion as professed by Calvin. Here he became a firm Protestant; and was enabled to pursue his studies by the liberality of a person of quality, who had left several exhibitions for young students. He was appointed rector of a college at Heidelberg, where he published his first volume of illustrious men in the year 1615. This volume, which consisted of philosophers, poets, writers on polite literature, and historians, &c. was followed by three others; that which treated of divines was printed in 1619; that of the lawyers came next; and, finally, that of the physicians; the two last were published in 1620. All the learned men, whose lives are contained in these four volumes, lived in the 16th, or beginning of the 17th century, and are either Germans or Flemings; but he published in 1618 the lives of twenty divines of other countries in a separate volume. All his divines are Protestants. The Lutherans were not pleased with him, for they thought him partial; nor will they allow his work to be a proper standard whereby to judge of the learning of Germany. He wrote other works besides his lives, and died in 1622.

ADAM'S Apple, a name given to a species of CITRUS.

ADAM'S Needle. See YUCCA.

ADAM'S Peak, a high mountain of the East Indies, in the island of Ceylon, on the top of which they believe the first man was created. See ADAM.

ADAM, or ADOM, a town in the Peræa, or on the other side the Jordan, over-against Jericho, where the Jordan began to be dried up on the passage of the Israelites; (Joshua.)

ADAMA, or ADMAH, one of the towns that were involved in the destruction of Sodom; (Moses.)

ADAMANT, a name sometimes given to the diamond. (See DIAMOND.) It is likewise applied to the scoriae of gold, the magnet, &c.

ADAMIC EARTH, a name given to common red clay, alluding to that species of earth of which the first man is supposed to have been made.

ADAMI POMUM, in anatomy, a protuberance in the fore-part of the throat, formed by the os hyoides. It is thought to be so called upon a strange conceit, that a piece of the forbidden apple, which Adam eat, stuck by the way and occasioned it.

ADAMITES, in ecclesiastical history, the name of a sect of ancient heretics, supposed to have been a branch of the Basilidians and Carpocratians.

Epiphanius tells us, that they were called Adamites from their pretending to be re-established in the state of innocence, and to be such as Adam was at the moment of his creation, whence they ought to imitate him in his nakedness. They detested marriage; maintaining, that the conjugal union would never have taken place upon earth had sin been unknown.

This

Adam
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Adamites.

Adamus

Adamson.

This obscure and ridiculous sect did not at first last long; but it was revived, with additional absurdities, in the twelfth century, by one Tandamus, since known by the name of *Tanchelin*, who propagated his errors at Antwerp, in the reign of the emperor Henry V. He maintained, that there ought to be no distinction between priests and laymen, and that fornication and adultery were meritorious actions. Tanchelin had a great number of followers, and was constantly attended by 3000 of these profligates in arms. His sect did not, however, continue long after his death: but another appeared under the name of *Turlupins*, in Savoy and Dauphiny, where they committed the most brutal actions in open day.

About the beginning of the fifteenth century, one Picard, a native of Flanders, spread these errors in Germany and Bohemia, particularly in the army of the famous Zisca, notwithstanding the severe discipline he maintained. Picard pretended that he was sent into the world as a new Adam, to re-establish the law of nature; and which, according to him, consisted in exposing every part of the body, and having all the women in common. This sect found also some partizans in Polland, Holland, and England: they assembled in the night; and it is asserted, that one of the fundamental maxims of their society was contained in the following verse:

Jura, perjura, secretum prodere noli.

ADAMUS, the philosopher's stone is so called by alchemists; they say it is an animal, and that it has carried its invisible *Eve* in its body, since the moment they were united by the Creator.

ADAMSHIDE, a district of the circle of Rastenburg, belonging to the king of Prussia, which, with Dombrosken, was bought, in 1737, for 42,000 dollars.

ADAMSON (Patrick), a Scottish prelate, archbishop of St Andrew's. He was born in the year 1543 in the town of Perth, where he received the rudiments of his education; and afterwards studied Philosophy, and took his degree of master of arts at the university of St Andrew's. In the year 1566, he set out for Paris, as tutor to a young gentleman. In the month of June of the same year, Mary queen of Scots being delivered of a son, afterwards James VI. of Scotland and First of England, Mr Adamson wrote a Latin poem on the occasion. This proof of his loyalty involved him in some difficulties, having been confined in France for six months; nor would he have easily got off, had not Queen Mary, and some of the principal nobility, interested themselves in his behalf. As soon as he recovered his liberty, he retired with his pupil to Bourges. He was in this city during the massacre at Paris; and the same persecuting spirit prevailing among the catholics at Bourges as at the metropolis, he lived concealed for seven months in a public house, the master of which, upwards of 70 years of age, was thrown from the top thereof, and had his brains dashed out, for his charity to heretics. Whilst Mr Adamson lay thus in his sepulchre, as he called it, he wrote his Latin poetical version of the Book of Job, and his Tragedy of Herod in the same language. In the year 1573, he returned to Scotland; and, having entered into holy orders, became minister of Paisley. In the year 1575, he was appointed one of the commissioners, by the general assembly, to settle the jurisdiction and po-

Adana. licy of the church; and the following year he was named, with Mr David Lindsay, to report their proceedings to the earl of Mortoun, then regent. About this time the earl made him one of his chaplains; and, on the death of bishop Douglas, promoted him to the archiepiscopal see of St Andrew's, a dignity which brought upon him great trouble and uneasiness: for now the clamour of the Presbyterian party rose very high against him, and many inconsistent absurd stories were propagated concerning him. Soon after his promotion, he published his catechism in Latin verse, a work highly approved even by his enemies; but, nevertheless, they still continued to persecute him with great violence. In 1578, he submitted himself to the general assembly, which procured him peace but for a very little time; for, the year following, they brought fresh accusations against him. In the year 1582, being attacked with a grievous disease, in which the physicians could give him no relief, he happened to take a simple medicine from an old woman, which did him service. The woman, whose name was Alison Pearson, was thereupon charged with witchcraft, and committed to prison, but escaped out of her confinement; however, about four years afterwards, she was again found and burnt for a witch. In 1583, king James came to St Andrew's; and the archbishop, being much recovered, preached before him, and disputed with Mr Andrew Melvil, in presence of his Majesty, with great reputation, which drew upon him fresh calumny and persecution. The king, however, was so well pleased with him, that he sent him ambassador to Queen Elizabeth, at whose court he resided for some years. His conduct, during his embassy, has been variously reported by different authors. Two things he principally laboured, viz. the recommending the king his master to the nobility and gentry of England, and the procuring some support for the episcopal party in Scotland. By his eloquent preaching, he drew after him such crowds of people, and raised in their minds such a high idea of the young king his master, that queen Elizabeth forbade him to enter the pulpit during his stay in her dominions. In 1584, he was recalled, and sat in the parliament held in August at Edinburgh. The Presbyterian party was still very violent against the archbishop. A provincial synod was held at St Andrew's in April 1586: the archbishop was here accused and excommunicated: he appealed to the king and the states, but this availed him little; for the mob being excited against him, he durst scarce appear in public. At the next general assembly, a paper being produced, containing the archbishop's submission, he was absolved from the excommunication. In 1588, fresh accusations were brought against him. The year following, he published the Lamentations of the prophet Jeremiah in Latin verse; which he dedicated to the king, complaining of his hard usage. In the latter end of the same year, he published a translation of the Apocalypse, in Latin verse; and a copy of Latin verses, addressed also to his Majesty, when he was in great distress. The king, however, was so far from giving him assistance, that he granted the revenue of his see to the duke of Lennox; so that the remaining part of this prelate's life was very wretched, he having hardly subsistence for his family. He died in 1591.

ADANA, a town of Asia, in Natolia, and in the province

Adansonia. province of Carmania. It is seated on the river Choquen; on the banks of which stands a strong little castle built on a rock. It has a great number of beautiful fountains brought from the river by means of water-works. Over the river there is a stately bridge of fifteen arches, which leads to the water-works. The climate is very pleasant and healthy, and the winter mild and serene: but the summer is so hot as to oblige the principal inhabitants to retire into the neighbouring mountains, where they spend six months among shady trees and grottoes, in a most delicious manner. The adjacent country is rich and fertile, and produces melons, cucumbers, pomegranates, pulse, and herbs of all sorts, all the year round; besides corn, wine, and fruits in their proper season. It is 30 miles east of Tarsus, on the road to Aleppo. E. long. 35. 42. N. lat. 38. 10.

ADANSONIA, ETHIOPIAN SOUR-GOURD, MONKIES-BREAD, OR AFRICAN CALABASH-TREE, a genus of the monodelphia order, belonging to the polyandria class of plants; the characters of which are: The *calyx* is a perianthium one-leav'd, half five-cleft, cup-form, (the divisions revolute), deciduous: The *corolla* consists of five petals, roundish, nerved, revolute, growing reciprocally with the claws and stamina: The *stamina* have numerous filaments, coalesced beneath into a tube, and crowning it, expanding horizontally; the antheræ kidney-form, incumbent: The *pistillum* has an egged germ; the stylus very long, tubular, variously intorted; the stigmata numerous (10) prismatic, villous, ray-expanded: The *pericarpium* is an oval capsule, woody, not gaping, 10-celled, with farinaceous pulp, the partitions membranous: The *seeds* are numerous, kidney-shaped, rather bony, and involved in a friable pulp.

There is at present but one known species belonging to this genus, the *BAOBAB*, which is perhaps the largest production of the whole vegetable kingdom. It is a native of Africa.

The trunk is not above 12 or 15 feet high, but from 65 to 78 feet round. The lowest branches extend almost horizontally; and as they are about 60 feet in length, their own weight bends their extremities to the ground, and thus form an hemispherical mass of verdure of about 120 or 130 feet diameter. The roots extend as far as the branches: that in the middle forms a pivot, which penetrates a great way into the earth; the rest spread near the surface. The flowers are in proportion to the size of the tree: and are followed by an oblong fruit, pointed at both ends, about 10 inches long, five or six broad, and covered with a kind of greenish down, under which is a ligneous rind, hard and almost black, marked with rays which divide it lengthwise into sides. The fruit hangs to the tree by a pedicle two feet long and an inch diameter. It contains a whitish spongy juicy substance; with seeds of a brown colour, and shaped like a kidney-bean. The bark of this tree is nearly an inch thick, of an ash-coloured grey, greasy to the touch, bright, and very smooth: the outside is covered with a kind of varnish; and the inside is green, speckled with red. The wood is white, and very soft; the first shoots of the year are green and downy.

The leaves of the young plants are entire, of an oblong form, about four or five inches long, and almost three broad towards the top, having several veins run-

ning from the middle rib; they are of a lucid green colour. As the plants advance in height, the leaves alter, and are divided into three parts, and afterwards into five lobes, which spread out in the shape of an hand. The tree sheds its leaves in November, and new ones begin to appear in June. It flowers in July, and the fruit ripens in October and November. It is very common in Senegal, and the Cape de Verd islands; and is found 100 leagues up the country at Gulam, and upon the sea coast as far as Sierra-leona.

The age of this tree is perhaps no less remarkable than its enormous size. Mr Adanson relates, that in a botanical excursion to the Magdalene Islands, in the neighbourhood of Goree, he discovered some calabash-trees, from five to six feet diameter, on the bark of which were engraved or cut to a considerable depth a number of European names. Two of these names, which he was at the trouble to repair, were dated one the 14th, the other the 15th century. The letters were about six inches long, but in breadth they occupied a very small part only of the circumference of the trunk: from whence he concluded they had not been cut when these trees were young. These inscriptions, however, he thinks sufficient to determine pretty nearly the age which these calabash-trees may attain; for even supposing that those in question were cut in their early years, and that trees grew to the diameter of six feet in two centuries, as the engraved letters evince, how many centuries must be requisite to give them a diameter of 25 feet, which perhaps is not the last term of their growth! The inscribed trees mentioned by this ingenious Frenchman had been seen in 1555, almost two centuries before, by Thevet, who mentions them in the relation of his voyage to Terra Antarctica or Australis. Adanson saw them in 1749.

The virtues and uses of this tree and its fruit are various. The negroes of Senegal dry the bark and leaves in the shaded air; and then reduce them to powder, which is of a pretty good green colour. This powder they preserve in bags of linen or cotton, and call it *lillo*. They use it every day, putting two or three pinches of it into a mess, whatever it happens to be, as we do pepper and salt: but their view is, not to give a relish to their food, but to preserve a perpetual and plentiful perspiration, and to temper the too great heat of the blood; purposes which it certainly answers, as several Europeans have proved by repeated experiments, preserving themselves from the epidemic fever, which, in that country, destroys Europeans like the plague, and generally rages during the months of September and October, when, the rains having suddenly ceased, the sun exhales the water left by them upon the ground, and fills the air with a noxious vapour. M. Adanson, in that critical season, made a light ptisan of the leaves of the baobab, which he had gathered in the August of the preceding year, and had dried in the shade; and drank constantly about a pint of it every morning, either before or after breakfast, and the same quantity of it every evening after the heat of the sun began to abate; he also sometimes took the same quantity in the middle of the day, but this was only when he felt some symptoms of an approaching fever. By this precaution he preserved himself, during the five years he resided at Senegal, from the diarrhoea and fever, which are so fatal there, and

Adanfonia and which are, however, the only dangerous diseases of the place; and other officers suffered very severely, only one excepted, upon whom M. Adanfon prevailed to use this remedy, which for its simplicity was despised by the rest. This ptisan alone also prevents that heat of urine which is common in these parts, from the month of July to November, provided the person abstains from wine.

Adar

The fruit is not less useful than the leaves and the bark. The pulp that envelopes the seeds has an agreeable acid taste, and is eaten for pleasure: it is also dried and powdered, and thus used medicinally in pestilential fevers, the dysentery, and bloody flux; the dose is a drachm, passed through a fine sieve, taken either in common water, or in an infusion of the plantain. This powder is brought into Europe under the name of *terra sigillata lemnia*. The woody bark of the fruit, and the fruit itself when spoiled, helps to supply the negroes with an excellent soap, which they make by drawing a ley from the ashes, and boiling it with palm-oil that begins to be rancid.

The trunks of such of these trees as are decayed, the negroes hollow out into burying places for their poets, musicians, buffoons: persons of these characters they esteem greatly while they live, supposing them to derive their superior talents from forcery or a commerce with demons; but they regard their bodies with a kind of horror when dead, and will not give them burial in the usual manner, neither suffering them to be put into the ground, nor thrown into the sea or any river, because they imagine that the water would not then nourish the fish, nor the earth produce its fruits. The bodies shut up in these trunks become perfectly dry without rotting, and form a kind of mummies without the help of embalment.

The baobab is very distinct from the calabash-tree of America, with which it has been confounded by father Labat. See CRESCENTIA.

Culture. This tree is propagated from seeds, which are brought from the countries where they grow naturally. Being natives only of hot climates, the plants will not thrive in the open air in Britain, even in summer. The seeds are therefore to be sown in pots, and plunged into a hot-bed, where the plants will appear in about six weeks, and in a short time after be fit to transplant. They must then be planted each in a separate pot, in light sandy earth, and plunged into a hot-bed, shading them until they have taken root: after which they should have fresh air admitted every day in warm weather: but must be sparingly watered, as being apt to rot. They grow quickly for two or three years, but afterwards make little progress; the lower part of the stem then begins to swell, and put out lateral branches, inclining to a horizontal position, and covered with a light grey bark.—Some of this kind of plants were raised from seeds obtained from Grand Cairo by Dr William Sherard, in 1724, and were grown to the height of 18 feet; but were all destroyed by the severe frost in 1740; after which they were unknown in Britain till the return of Mr Adanfon to Paris in 1754.

ADAPTERS, or ADOPTERS. See CHEMISTRY, (*Index.*)

ADAR, the name of a Hebrew month, answering to the end of February and beginning of March, the

12th of their sacred, and 6th of their civil year. On the 7th day of it, the Jews keep a feast for the death of Moses; on the 13th, they have the feast of Esther; and on the 14th, they celebrate the feast of Purim, for their deliverance from Haman's conspiracy.—As the lunar year, which the Jews followed in their calculations, is shorter than the solar by about 11 days, which at the end of three years make a month, they then intercalate a 13th month, which they call *Veadar*, or the *second Adar*.

Adarce
Addiction.

ADARCE, a kind of concreted salts found on reeds and other vegetables, and applied by the ancients as a remedy in several cutaneous diseases.

ADARCON, in Jewish antiquity, a gold coin mentioned in scripture, worth about 15s. Sterling.

ADARME, in commerce, a small weight in Spain, which is also used at Buenos-Aires, and in all Spanish America. It is the 16th part of an ounce, which at Paris is called the *demi-gros*. But the Spanish ounce is seven *per cent.* lighter than that of Paris. Stephens renders it in English by a *dram*.

ADATAIS, ADATSI, or ADATYS, in commerce, a muslin or cotton-cloth, very fine and clear, of which the piece is ten French ells long, and three quarters broad. It comes from the East-Indies; and the finest is made at Bengal.

ADCORDABILIS DENARIJ, in old law books, signify money paid by the vassal to his lord, upon the selling or exchanging of a feud.

ADCRESCENTES, among the Romans, denoted a kind of soldiery, entered in the army, but not yet put on duty; from these the standing forces were recruited. See ACCENSI.

ADDA, in geography, a river of Switzerland and Italy, which rises in mount Braulio, in the country of the Grisons, and, passing through the Valteline, traverses the lake Como and the Milanese, and falls into the Po, near Cremona.

ADDEPHAGIA, in medicine, a term used by some physicians, for gluttony, or a voracious appetite.

ADDER, in zoology, a name for the VIPER. See COLUBER.

ADDER-Bolts or Adder-flies. See LIBELLULA.

Sea-ADDER, the English name of a species of SYNGNATHUS.

Water-ADDER, a name given to the COLUBER *Natrix*.

ADDER-stung, is used in respect of cattle, when stung with any kind of venomous reptiles, as adders, scorpions, &c. or bit by a hedge-hog or shrew.—For the cure of such bites, some use an ointment made of dragon's blood, with a little barley-meal, and the whites of eggs.

ADDER Wort, or Snake-wood. See POLYGONUM.

ADDEXTRATORES, in the court of Rome, the pope's mitre-bearers, so called, according to Ducange, because they walk at the Pope's right-hand when he rides to visit the churches.

ADDICE, or ADZE, a kind of crooked ax used by ship-wrights, carpenters, coopers, &c.

ADDICTI, in antiquity, a kind of slaves, among the Romans, adjudged to serve some creditor whom they could not otherwise satisfy, and whose slaves they became till they could pay or work out the debt.

ADDICTION, among the Romans, was the making

Additio, king over goods to another, either by sale or by legal sentence; the goods so delivered were called *bona addicta*. Debtors were sometimes delivered over in the same manner; and thence called *servi addicti*.

ADDICTIO IN DIEM, among the Romans, the adjudging a thing to a person for a certain price, unless by such a day the owner, or some other, give more for it.

ADDISON (Lancelot), son of Lancelot Addison a clergyman; was born at Mouldisneaburne, in the parish of Crosby Ravensworth in Westmoreland, in the year 1632. He was educated at Queen's College, Oxford; and at the Restoration of King Charles II. accepted of the chaplainship of the garrison of Dunkirk: but that fortress being delivered up to the French in 1662, he returned to England, and was soon after made chaplain to the garrison of Tangier; where he continued seven years, and was greatly esteemed. In 1670 he returned to England, and was made chaplain in ordinary to the king; but his chaplainship of Tangier being taken from him on account of his absence, he found himself straitened in his circumstances, when he seasonably obtained the rectory of Milston in Wiltshire, worth about 120*l.* *per annum*. He afterwards became a prebendary of Sarum; took his degree of doctor of divinity at Oxford; and in 1683 was made dean of Litchfield, and the next year archdeacon of Coventry. His life was exemplary; his conversation pleasing, and greatly instructive; and his behaviour as a gentleman, a clergyman, and a neighbour, did honour to the place of his residence. He wrote, 1. A Short Narrative of the Revolutions of the Kingdoms of Fez and Morocco: 2. The present History of the Jews: 3. A Discourse on Catechising: 4. A Modest Plea for the Clergy: 5. An Introduction to the Sacrament: 6. The first State of Mahometism: and several other pieces. This worthy divine died on the 20th of April 1703, and left three sons: Joseph, the subject of the next article; Gullston, who died while governor of Fort St George; Lancelot, master of arts, and fellow of Magdalene College in Oxford; and one daughter, first married to Dr Satre prebendary of Westminster, and afterwards to Daniel Combes, Esq.

ADDISON (Joseph), son of Dean Addison the subject of the last article. He was born at Milston, near Ambresbury, in Wiltshire, on the 11th of May 1672; and not being thought likely to live, was baptized the same day. He received the first rudiments of his education at the place of his nativity, under the reverend Mr Naish; but was soon removed to Salisbury, under the care of Mr Taylor; and from thence to the charter-house, where he commenced his acquaintance with Sir Richard Steele. About fifteen, he was entered at Queen's College, Oxford, where he applied very closely to the study of classical learning, in which he made a surprising proficiency.

In the year 1687, Dr Lancaster, dean of Magdalene College, having, by chance, seen a Latin poem of Mr Addison's, was so pleased with it, that he immediately got him elected into that house, where he took up his degrees of bachelor and master of arts. His Latin pieces in the course of a few years, were exceedingly admired in both universities; nor were they less esteemed abroad, particularly by the celebrated Boileau, who is reported to have said, that he would not have

written against Perrault, had he before seen such excellent pieces by a modern hand. He published nothing in English before the 22d year of his age; when there appeared a short copy of verses written by him, and addressed to Mr Dryden, which procured him great reputation from the best judges. This was soon followed by a translation of the Fourth Georgic of Virgil (omitting the story of Aristæus), much commended by Mr Dryden. He wrote also the Essay on the Georgics, prefixed to Mr Dryden's translation. There are several other pieces written by him about this time; amongst the rest, one dated the 3d of April 1694, addressed to H. S. that is, Dr Sacheverel, who became afterwards so famous, and with whom Mr Addison lived once in the greatest friendship; but their intimacy was some time after broken off by their disagreement in political principles. In the year 1695, he wrote a poem to King William on one of his campaigns, addressed to Sir John Somers lord keeper of the great seal. This gentleman received it with great pleasure, took the author into the number of his friends, and bestowed on him many marks of his favour.

Mr Addison had been closely pressed, while at the university, to enter into holy orders; and had once resolved upon it: but his great modesty, his natural diffidence, and an uncommonly delicate sense of the importance of the sacred function, made him afterwards alter his resolution; and having expressed an inclination to travel, he was encouraged thereto by his patron above mentioned, who by his interest procured him from the crown a pension of 300*l.* *per annum* to support him in his travels. He accordingly made a tour to Italy in the year 1699; and, in 1701, he wrote a poetical epistle from Italy to the Earl of Halifax, which has been universally esteemed as a most excellent performance. It was translated into Italian verse by the Abbot Antonio Maria Salvini, Greek professor at Florence. In the year 1705, he published an account of his travels, dedicated to Lord Somers; which, though at first but indifferently received, yet in a little time met with its deserved applause.

In the year 1702, he was about to return to England, when he received advice of his being appointed to attend Prince Eugene, who then commanded for the emperor in Italy: but the death of King William happening soon after, put an end to this affair as well as his pension; and he remained for a considerable time unemployed. But an unexpected incident at once raised him, and gave him an opportunity of exerting his fine talents to advantage: for in the year 1704, the lord treasurer Godolphin happened to complain to Lord Halifax, that the Duke of Marlborough's victory at Blenheim had not been celebrated in verse in the manner it deserved; and intimated, that he would take it kindly if his lordship, who was the known patron of the poets, would name a gentleman capable of doing justice to so elevated a subject. Lord Halifax replied, somewhat hastily, that he did know such a person, but would not mention him; adding, that long had he seen, with indignation, men of no merit maintained in luxury at the public expence, whilst those of real worth and modesty were suffered to languish in obscurity. The treasurer answered very coolly, that he was sorry there should be occasion for such an observation, but that he would do his endeavour to wipe off such reproaches for the

Addison. the future; and he engaged his honour, that whoever his lordship named as a person capable of celebrating this victory, should meet with a suitable recompence. Lord Halifax thereupon named Mr Addison; insisting, however, that the treasurer himself should send to him; which he promised. Accordingly he prevailed on Mr Boyle (afterwards Lord Carlton) then chancellor of the exchequer, to make the proposal to Mr Addison; which he did in so polite a manner, that our author readily undertook the task. The lord treasurer had a sight of the piece, when it was carried no farther than the celebrated simile of the angel; and was so pleased with it, that he immediately appointed Mr Addison a commissioner of appeals, vacant by the promotion of Mr Locke, chosen one of the lords commissioners for trade. The Campaign is addressed to the Duke of Marlborough: it gives a short view of the military transactions in 1704, and contains a noble description of the two great actions at Schellemburg and Blenheim. In 1705, he attended Lord Halifax to Hanover; and the ensuing year was appointed under-secretary to Sir Charles Hedges secretary of state; in which office he acquitted himself so well, that the Earl of Sunderland, who succeeded Sir Charles in December, continued Mr Addison in his employment.

A taste for operas beginning at this time to prevail in England, and many persons having solicited Mr Addison to write one, he complied with their request, and composed his Rosamond. This, however, whether from the defect of the music, or from the prejudices in favour of the Italian taste, did not succeed upon the stage; but the poetry of it has, and always will be, justly admired. About this time, Sir Richard Steele composed his comedy of the Tender Husband, to which Mr Addison wrote a prologue. Sir Richard surprised him with a dedication of this play, and acquainted the public, that he was indebted to him for some of the most excellent strokes in the performance. The Marquis of Wharton, being appointed lord lieutenant of Ireland in 1709, took Mr Addison with him as his secretary. Her majesty also made him keeper of the records of Ireland, and, as a farther mark of her favour, considerably augmented the salary annexed to that place. Whilst he was in this kingdom, the Tatler was first published; and he discovered his friend Sir Richard Steele to be the author, by an observation on Virgil, which he had communicated to him. He afterwards assisted considerably in carrying on this paper, which the author acknowledges. The Tatler being laid down, the Spectator was set on foot, and Mr Addison furnished great part of the most admired papers. The Spectator made its first appearance in March 1711, and was brought to a conclusion in September 1712.

His celebrated Cato appeared in 1713. He formed the design of a tragedy upon this subject when he was very young, and wrote it when on his travels: he retouched it in England, without any intention of bringing it on the stage; but his friends being persuaded it would serve the cause of liberty, he was prevailed on by their solicitations, and it was accordingly exhibited on the theatre, with a prologue by Mr Pope, and an epilogue by Dr Garth. It was received with the most uncommon applause, having run thirty-five nights without interruption. The Whigs applauded

every line in which liberty was mentioned, as a satire on the Tories; and the Tories echoed every clap, to show that the satire was unfelt. When it was printed, notice was given that the Queen would be pleased if it was dedicated to her; "but as he had designed that compliment elsewhere, he found himself obliged," says Tickell, "by his duty on the one hand, and his honour on the other, to send it into the world without any dedication." It was no less esteemed abroad, having been translated into French, Italian, and German; and it was acted at Leghorn, and several other places, with vast applause. The Jesuits of St Omers made a Latin version of it, and the students acted it with great magnificence.

About this time, another paper called the Guardian was published by Steele, to which Addison was a principal contributor. It was a continuation of the Spectator, and was distinguished by the same elegance and the same variety; but, in consequence of Steele's propensity to politics, was abruptly discontinued in order to write the Englishman.

The papers of Addison are marked in the Spectator by one of the letters in the name of *Clio*, and in the Guardian by a *Hand*. Many of these papers were written with powers truly comic, with nice discrimination of characters, and accurate observation of natural or accidental deviations from propriety: but it was not supposed that he had tried a comedy on the stage, till Steele, after his death, declared him the author of "The Drummer." This, however, he did not know to be true by any cogent testimony: for when Addison put the play into his hands, he only told him it was the work of a gentleman in the company; and when it was received, as is confessed, with cold disapprobation, he was probably less willing to claim it. Tickell omitted it in his collection; but the testimony of Steele, and the total silence of any other claimant, has determined the public to assign it to Addison, and it is now printed with his other poetry. Steele carried "The Drummer" to the playhouse, and afterwards to the press, and sold the copy for 50 guineas. To Steele's opinion may be added the proof supplied by the play itself, of which the characters are such as Addison would have delineated, and the tendency such as Addison would have promoted.

It is said that Mr Addison intended to have composed an English dictionary upon the plan of the Italian (*Della Crusca*); but, upon the death of the queen, being appointed secretary to the lords justices, he had not leisure to carry on such a work. When the Earl of Sunderland was appointed lord lieutenant of Ireland, Mr Addison was again made secretary for the affairs of that kingdom; and, upon the Earl's being removed from the lieutenancy, he was chosen one of the lords of trade.

Not long afterwards an attempt was made to revive the Spectator, at a time indeed by no means favourable to literature, when the succession of a new family to the throne filled the nation with anxiety, discord, and confusion; and either the turbulence of the times or the satiety of the readers put a stop to the publication, after an experiment of 80 numbers, which were afterwards collected into an eighth volume, perhaps more valuable than any of those that went before it: Addison produced more than a fourth part.

Addison. In 1715, he began the *Freeholder*, a political paper, which was much admired, and proved of great use at that juncture. He published also, about this time, verses to Sir Godfrey Kneller upon the king's picture, and some to the Princess of Wales with the tragedy of *Cato*.

Before the arrival of King George he was made secretary to the regency, and was required by his office to send notice to Hanover that the queen was dead, and that the throne was vacant. To do this would not have been difficult to any man but Addison, who was so overwhelmed with the greatness of the event, and so distracted by choice of expression, that the lords, who could not wait for the niceties of criticism, called Mr Southwell, a clerk in the house, and ordered him to dispatch the message. Southwell readily told what was necessary, in the common style of business, and valued himself upon having done what was too hard for Addison.

In 1716, he married the countess dowager of Warwick, whom he had solicited by a very long and anxious courtship. He is said to have first known her by becoming tutor to her son. The marriage, if contradicted report can be credited, made no addition to his happiness; it neither found them nor made them equal. She always remembered her own rank, and thought herself intitled to treat with very little ceremony the tutor of her son. It is certain that Addison has left behind him no encouragement for ambitious love. The year after, 1717, he rose to his highest elevation, being made secretary of state; but is represented as having proved unequal to the duties of his place. In the house of commons he could not speak, and therefore was useless to the defence of the government. In the office he could not issue an order without losing his time in quest of fine expressions. At last, finding by experience his own inability for public business, he was forced to solicit his dismissal, with a pension of 1500*l.* a-year. Such was the account of those who were inclined to detract from his abilities; but by others his relinquishment was attributed to declining health, and the necessity of recess and quiet.

In his retirement, he applied himself to a religious work †, which he had begun long before; part of which, scarce finished, has been printed in his works. He intended also to have given an English paraphrase of some of David's psalms. But his ailments increased, and cut short his designs. He had for some time been oppressed by an asthmatic disorder, which was now aggravated by a dropsy, and he prepared to die conformably to his precepts and professions. He sent, as Pope relates, a message by the Earl of Warwick to Mr Gay, desiring to see him: Gay, who had not visited him for some time before, obeyed the summons, and found himself received with great kindness. The purpose for which the interview had been solicited was then discovered: Addison told him that he had injured him; but that, if he recovered, he would recompense him. What the injury was he did not explain, nor did Gay ever know; but supposed that some preferment designed for him had by Addison's intervention been withheld.— Another death-bed interview, of a more solemn nature, is recorded: Lord Warwick was a young man of very irregular life, and perhaps of loose opinions. Addison, for whom he did not want respect, had very diligently

Nº 3.

endeavoured to reclaim him; but his arguments and expostulations had no effect: One experiment, however, remained to be tried. When he found his life near its end, he directed the young lord to be called: and when he desired, with great tenderness, to hear his last injunctions, told him, "I have sent for you that you may see how a Christian can die." What effect this awful scene had on the Earl's behaviour is not known: he died himself in a short time. Having given directions to Mr Tickell for the publication of his works, and dedicated them on his death-bed to his friend Mr Craggs, he died June 17. 1719, at Holland-house, leaving no child but a daughter who is still living.

Addison's course of life before his marriage has been detailed by Pope. He had in the house with him Budgell, and perhaps Philips. His chief companions were Steele, Budgell, Philips, Carey, Davenant, and Colonel Brett. With one or other of these he always breakfasted. He studied all morning; then dined at a tavern, and went afterwards to Button's. From the coffeehouse he went again to the tavern, where he often sat late, and drank too much wine.

Dr Johnson, in delineating the character of Addison, observes with Tickell, that he employed wit on the side of virtue and religion. He not only made the proper use of wit himself, but taught it to others; and from his time it has been generally subservient to the cause of reason and truth. He has dissipated the prejudice that had long connected gaiety with vice, and easiness of manners with laxity of principles. He has restored virtue to its dignity, and taught innocence not to be ashamed. This is an elevation of literary character, "above all Greek, above all Roman fame." No greater felicity can genius attain than that of having purified intellectual pleasure, separated mirth from indecency, and wit from licentiousness; of having taught a succession of writers to bring elegance and gaiety to the aid of goodness; and, to use expressions yet more awful, of having "turned many to righteousness." As a describer of life and manners, he must be allowed to stand perhaps the first of the first rank. His humour, which, as Steele observes, is peculiar to himself, is so happily diffused as to give the grace of novelty to domestic scenes and daily occurrences. He never "outsteps the modesty of nature," nor raises merriment or wonder by the violation of truth. His figures neither divert by distortion, nor amaze by aggravation. He copies life with so much fidelity, that he can be hardly said to invent; yet his exhibitions have an air so much original, that it is difficult to suppose them not merely the product of imagination. As a teacher of wisdom he may be confidently followed. His religion has nothing in it enthusiastic or superstitious; he appears neither weakly credulous nor wantonly sceptical; his morality is neither dangerously lax nor impracticably rigid. All the enchantment of fancy and all the cogency of argument are employed to recommend to the reader his real interest, the care of pleasing the Author of his being. Truth is shown sometimes as the phantom of a vision, sometimes appears half veiled in an allegory; sometimes attracts regard in the robes of fancy, and sometimes steps forth in the confidence of reason. She wears a thousand dresses, and in all is pleasing.

The

Addison. The Doctor, however, has related the following anecdote, which every admirer of Addison, every man of feeling, must be reluctant to believe. "Steele (says the Doctor), whose imprudence of generosity, or vanity of profusion, kept him always incurably necessitous, upon some pressing exigence, in an evil hour, borrowed an hundred pounds of his friend, probably without much purpose of repayment; but Addison, who seems to have had other notions of a hundred pounds, grew impatient of delay, and reclaimed his loan by an execution. Steele felt, with great sensibility, the obduracy of his creditor; but with emotions of sorrow rather than of anger." It is much to be wished, says Dr Kippis, that Dr Johnson had produced his authority for this narration. It is very possible, that it may be only a story the Doctor had somewhere heard in conversation, and which is entirely groundless: "and this I am the rather inclined to believe, as I have been assured, by one of the most respectable characters in the kingdom, that the fact hath no foundation in truth." Mr Potter, in a late publication, hath informed us, that he is told by the best authority, that the story is an absolute falsehood.

Mr Tyers, in "An historical Essay on Mr Addison," printed, but not published, has mentioned some facts concerning him, with which we were not before acquainted. These are, That he was laid out for dead as soon as he was born: that, when he addressed his verses on the English poets to Henry Sacheverell, he courted that gentleman's sister: that, whenever Jacob Tonson came to him for the Spectator, Bayle's French Historical and Critical Dictionary lay always open before him: that, upon his return to England, after his travels, he discharged some old debts he had contracted at Oxford, with the generosity of good interest: that he was put into plentiful circumstances by the death of a brother in the East Indies: that, having received encouragement from a married lady, of whom he had been formerly enamoured, he had the integrity to resist the temptation: that he refused a gratification of a three hundred pounds bank-note, and afterwards of a diamond-ring of the same value, from a Major Dunbar, whom he had endeavoured to serve in Ireland by his interest with lord Sunderland: and that his daughter by lady Warwick is still alive and unmarried, residing at Bilton near Rugby, and possessing an income of more than twelve hundred a-year.

The following letter, which probably relates to the case of Major Dunbar, reflects great honour on Mr Addison's integrity. "June 26. 1715. SIR, I find there is a very strong opposition formed against you; but I shall wait on my lord lieutenant this morning, and lay your case before him as advantageously as I can, if he is not engaged in other company. I am afraid what you say of his grace does not portend you any good. And now, Sir, believe me, when I assure you I never did, nor ever will, on any pretence whatsoever, take more than the stated and customary fees of my office. I might keep the contrary practice concealed from the world, were I capable of it, but I could not from myself; and I hope I shall always fear the reproaches of my own heart more than those of all mankind. In the mean time, if I can serve a gentleman of merit, and such a character as you bear in the world, the satisfaction I meet with on

Vol. I. Part I.

such an occasion is always a sufficient, and the only reward to, Sir, your most obedient, humble servant, J. ADDISON."—The anecdote which follows was told by the late Dr Birch. Addison and Mr Temple Stanyan were very intimate. In the familiar conversations which passed between them, they were accustomed freely to dispute each other's opinions. Upon some occasion, Mr Addison lent Stanyan five hundred pounds. After this, Mr Stanyan behaved with a timid reserve, deference, and respect; not conversing with the same freedom as formerly, or canvassing his friend's sentiments. This gave great uneasiness to Mr Addison. One day they happened to fall upon a subject, on which Mr Stanyan had always been used strenuously to oppose his opinion. But, even upon this occasion, he gave way to what his friend advanced, without interposing his own view of the matter. This hurt Mr Addison so much, that he said to Mr Stanyan, "Either contradict me, or pay me the money."

In Tickell's edition of Mr Addison's works there are several pieces hitherto unmentioned, viz. The Dissertation on Medals; which, though not published till after his death, yet he had collected the materials, and began to put them in order, at Vienna, in 1702. A pamphlet, intitled, The present State of the War, and the Necessity of an Augmentation, considered. The late Trial and Conviction of Count Tariff. The Whig Examiner came out on the 14th of September 1716: there were five of these papers attributed to Mr Addison, and they are the severest pieces he ever wrote. He is said also to have been the author of a performance intitled *Dissertatio de insignioribus Romanorum Poetis*, and of a Discourse on Ancient and Modern Learning.

ADDITAMENT, something added to another. Thus physicians call the ingredients added to a medicine already compounded, *additaments*.

ADDITION, is the joining together or uniting two or more things, or augmenting a thing by the accession of others thereto.

ADDITION, in ARITHMETIC, ALGEBRA, &c. See these articles.

ADDITION, in music, a dot marked on the right side of a note, signifying that it is to be sounded or lengthened half as much more as it would have been without such mark.

ADDITION, in law, is that name or title which is given to a man over and above his proper name and surname, to show of what estate, degree, or mystery he is; and of what town, village, or country.

ADDITIONS of Estate, or Quality, are, Yeoman, Gentleman, Esquire, and such like.

ADDITIONS of Degree, are those we call names of dignity; as Knight, Lord, Earl, Marquis, and Duke.

ADDITIONS of Mystery, are such as scrivener, painter, mason, and the like.

ADDITIONS of Place, are, of Thorp, of Dale, of Woodstock.—Where a man hath household in two places, he shall be said to dwell in both; so that his addition in either may suffice. Knave was anciently a regular addition. By stat. 1. Hen. V. cap. 5. it was ordained, that in such suits or actions where process of outlawry lies, such addition should be made to the name of the defendant, to show his estate, mystery, and place where he dwells; and that the writs not ha-

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ving such additions shall abide if the defendant take exception thereto; but not by the office of the court. The reason of this ordinance was, that one man might not be troubled by the outlawry of another; but by reason of the certain addition, every person might bear his own burden.

ADDITIONS, in distilling, a name given to such things as are added to the wash, or liquor, while in a state of fermentation, in order to improve the vinosity of the spirit, procure a larger quantity of it, or give it a particular flavour. All things, of whatever kind, thus added in the time of fermentation, are called by those of the business who speak most intelligently *additions*; but many confound them with things of a very different nature, under the name of *ferments*. See DISTILLING.

ADDITIONS, in heraldry, some things added to a coat of arms, as marks of honour; and therefore directly opposite to abatements. Among additions we reckon *BORBURE*, *QUARTER*, *CANTON*, *GYRON*, *PILE*, &c. See these articles.

ADDRESS, in a general sense, is used for skill and good management, and of late has been adopted from the French. It is used also in commerce, as synonymous with direction to a person or place. The word is formed of the French verb, *adresser*, *To direct any thing to a person*.

ADDUCENT MUSCLES, or ADDUCTORS, in anatomy, those muscles which pull one part of the body towards another. See ANATOMY, *Table of the Muscles*.

ADEB, in commerce, the name of a large Egyptian weight, used principally for rice, and consisting of 210 okes, each of three rotolos, a weight of about two drams less than an English pound. But this is no certain weight; for at Rosetto the adeb is only 150 okes.

ADEL, a kingdom on the eastern coast of Africa, which reaches as far as the straits of Babelmandel, which unite the Red Sea to the sea of Arabia. This country produces corn, and feeds a great number of cattle. The inhabitants carry on a trade in gold, silver, ivory, oil, frankincense, a sort of pepper, and other merchandises of Arabia and the Indies. The king was formerly a vassal to the grand negus of Abyssinia: but being Mahometans, and the Abyssinians a sort of Christians, they could not agree; and in 1535 came to an open rupture, when the Adeliens threw off the yoke, seeking protection from the Grand Signior. The principal places are, Adela, seated in the centre of the country, and is the town where the king resides: Zeila, near the Arabian Sea, is a rich town, and has a good trade: Barbora, near the sea-coast, is an ancient trading town. It rains very seldom in this country.

ADELIA, a genus of the monadelphia order, belonging to the dicecia class of plants; the characters of which are: The *MALE calyx* is a perianthium one-leaved, three-parted; the florets subnerved and concave: No *corolla*: The *stamina* consist of many capillary filaments the length of the calyx, conjoined at the base in a cylinder; the antheræ are roundish. The *FEMALE calyx* is a five-leaved perianthium; the leaflets subnerved, concave, persistent: No *corolla*: The *pistillum* has a roundish germen; the styli are three, short, and divaricated; the stigmata lacerated: The *perianthium* is a three-grained, roundish, three-celled capsule: The *seeds* are solitary and roundish. In the natural

method, this genus belongs to the 38th order, *Tricoccæ*. Of this genus there are three species; the *bernardia*, the *ricinella*, and *acidoton*, for which we have no proper names in English. They are natives of Jamaica. and are akin to the ricinus or croton, and may be propagated in hots-beds from seeds procured from Jamaica.

ADELME, or ALDHLM, son to Kenred, nephew to Ina king of the West-Saxons; after having been educated abroad, was abbot of Malmbsbury 30 years. He was the first Englishman who wrote in Latin, the first who brought poetry into England, and the first bishop of Sherburn. He lived in great esteem till his death, which happened in 709. He was canonized, and many miracles were told of him. He is mentioned with great honour by Camden and Bayle, and his life was written by William of Malmbsbury.

ADELPHIANI, in church-history, a sect of ancient heretics, who fasted always on Sundays.

ADELSCALC, in ancient customs, denotes a servant of the king. The word is also written *adelschalche*, and *adelscalcus*. It is compounded of the German *anel*, or *edel*, "noble," and *scalc*, "servant." Among the Bavarians, *adelscales* appear to have been the same with royal *thanes* among the Saxons, and those called *ministri regis* in ancient charters.

ADEMPITION, in the civil law, implies the revocation of a grant, donation, or the like.

ADEN, formerly a rich and considerable town of Arabia the Happy. It is seated by the sea-side, a little eastward of the straits of Babelmandel.

ADENANTHERA, BASTARD FLOWER-FENCE, a genus of the monogynia order, belonging to the decandria class of plants. In the natural method, it belongs to the 33d order, *Lomentaceæ*. The characters are: The *calyx* is a perianthium consisting of one very small five-toothed leaf. The *corolla* consists of five bell-shaped lanceolate sessile petals, convex within and concave under. The *stamina* have ten erect subulated filaments shorter than the corolla; the antheræ are roundish, incumbent, bearing a globular gland on the exterior top. The *pistillum* has a long gibbous germen; the stylus subulated the length of the stamina; the stigma simple. The *pericarpium* is a long compressed membranous legumen. The *seeds* are very numerous, roundish, and remote.

Only one species of this plant is known in Britain. but there is a variety, with scarlet seeds; which, however, is rare, and grows very slowly. It is a native of India, and rises to a considerable height. It is as large as the tamarind tree; spreads its branches wide on every side, and makes a fine shade; for which reason, it is frequently planted by the inhabitants in their gardens or near their habitations. The leaves of this tree are doubly winged, the flowers of a yellow colour, and disposed in a long bunch. These are succeeded by long twisted membranaceous pods, inclosing several hard compressed seeds, of a beautiful scarlet, or shining black, colour. This plant must be raised in a hot bed, and kept during winter in a stove.

ADENBURG, or ALDENBURG, a town of Westphalia, and in the duchy of Burg, subject to the Elector Palatine. It is 12 miles N. E. of Cologne, and 17 W. of Bonn; E. Long. 7. 25. Lat. 51. 2.

ADENOGRAPHY, that part of anatomy which treats of the glandular parts. See ANATOMY.

Adelme
Adeno-
graphy.

ADE-

Adenoides

Adhatoda.

ADENOIDES, glandulous, or of a glandular form; an epithet applied to the PROSTATE.

ADENOLOGY, the same with Adenography.

ADENOS, a kind of cotton, otherwise called *marine cotton*. It comes from Aleppo by the way of Marseilles, where it pays 20 *per cent.* duty.

ADEONA, in mythology, the name of a goddess invoked by the Romans when they set out upon a journey.

ADEPHAGIA, in mythology, the goddess of gluttony, to whom the Sicilians paid religious worship.

ADEPS, in anatomy, the fat found in the abdomen. It also signifies animal fat of any kind.

ADEPTS, a term among alchemists for those who pretended to have found the panacea or philosophers-stone.

ADERBIJAN, a province of Persia, bounded on the N. by Armenia Proper, on the S. by Irac-Agemi, on the E. by Ghilan, and on the W. by Curdistan. The principal town is Tauris; from 42. to 48. long. from 36. to 39. lat.

ADERNO, a small place in the Val di Demona in the kingdom of Sicily: E. long. 15. 25. lat. 28. 5. The ancient ADUANUM.

ADES, or HADES, denotes the invisible state. In the heathen mythology, it comprehends all those regions that lie beyond the river Styx, viz. Erebus, Tartarus, and Elysium. See HELL.

ADESSENARIANS, ADESSENARII, in church-history, a sect of Christians who hold the real presence of Christ's body in the eucharist, though not by way of transubstantiation. They differ considerably as to this presence; some holding that the body of Christ is in the bread; others that it is about the bread; and others that it is under the bread.

ADFILIATION, a Gothic custom, whereby the children of a former marriage are put upon the same footing with those of the second. This is also called *unio prolium*, and still retained in some parts of Germany.

AD FINES (Antonine), a town of Switzerland, supposed to be the modern *Pfin*, in the north of the district of Turgow, on the rivulet Thur, not far from the borders of Suabia, about half-way between Constance and Frauenfeld. So called, because when Cicerina, general of the emperor Vitellius, with the auxiliary Rhetians, defeated the Helvetii, the former extended their borders thus far, their territory ending here; and, in time of the Romans, it was the last town in this quarter, and of some repute.

ADHA, a festival which the Mahometans celebrate on the 10th day of the month *Dhoulhégat*, which is the 12th and last of their year. This month being particularly destined for the ceremonies which the pilgrims observe at Mecca, it takes its name from thence, for the word signifies *the month of Pilgrimage*. On that day they sacrifice with great solemnity, at Mecca, and no where else, a sheep, which is called by the same name as the festival itself. The Turks commonly call this festival the *Great Beiram*, to distinguish it from the lesser, which ends their fast, and which the Christians of the Levant call the *Easter of the Turks*. The Mahometans celebrate this festival, out of the city of Mecca, in a neighbouring valley; and sometimes they sacrifice there a camel. See BAIRAM.

ADHATODA, in botany. See JUSTICIA.

ACTION OF ADHERENCE, in Scots law; an action competent to a husband or wife, to compel either party to adhere, in case of desertion.

ADHESION, in a general sense, implies the sticking or adhering of bodies together.

ADHESION, in philosophy. See COHESION.

ADHESION, in anatomy, a term for one part sticking to another, which in a natural state are separate. For the most part, if any of those parts in the thorax or belly lie in contact, and inflame, they grow together. The lungs very frequently adhere to the pleura.

ADHIL, in astronomy, a star of the sixth magnitude, upon the garment of Andromeda, under the last star in her foot.

ADHOA, in ancient customs, denotes what we otherwise call *relief*. In which sense we sometimes also find the word written *adoba*, *adhoamentum*, and *adhogamentum*.

ADIANTHUM, MAIDEN-HAIR; a genus of the order of filices, belonging to the cryptogamia class of plants. The fructifications are collected in oval spots under the reflected tops of the fronds.

Species. Of this genus botanical writers enumerate fifteen species; the most remarkable are the following. 1. The capillus veneris, or true maiden-hair, is a native of the southern parts of France, from whence it is brought to Britain; though it is likewise said to grow plentifully in Cornwall, and the Trichomanes has been almost universally substituted for it. 2. The pedatum, or American maiden-hair, is a native of Canada; and grows in such quantities, that the French send it from thence in package for other goods, and the apothecaries of Paris use it for maiden-hair in the compositions wherein that is ordered. 3. The trapeziforme, or black American maiden-hair, is a native of Jamaica; and has shining black stalks, and leaves of an odd shape, which make an agreeable variety among other plants, so is sometimes cultivated in gardens.

Culture. The first species grows naturally out of the joints of walls and fissures of rocks. It ought therefore to be planted in pots filled with gravel and lime-rubbish; where it will thrive much better than in good earth. It must also be sheltered under a frame during the winter.—The second is to be treated in the same manner; but the third will not thrive in Britain, unless kept in a stove during the winter.

Properties. The true maiden-hair has been greatly celebrated in disorders of the breast proceeding from a thinness and acrimony of the juices; and likewise for opening obstructions of the viscera, and promoting the expectoration of tough phlegm. But modern practice pays little regard to it; the asplenium trichomanes, or English maiden-hair, supplying its place. See ASPLENIUM.

ADIAPHORISTS, in church-history, a name importing lukewarmness, given, in the 16th century, to the moderate Lutherans, who embraced the opinions of Melancthon, whose disposition was vastly more pacific than that of Luther.

ADIAPHOROUS, ADIAPHORUS, a name given by Mr Boyle to a kind of spirit distilled from tartar and some other vegetable bodies; and which is neither acid, vinous, nor urinous; but in many respects different from any other sort of spirit.

ADJAZZO, ADRAZZO, or AJACCIO, in geography,

Adjective a handsome town and castle of Corsica in the Mediterranean, with a bishop's see, and a good harbour. It is populous, and fertile in wine. It is 27 miles S. W. of Corte. E. long. 41. 54. lat. 38. 5.

Adjudication.

ADJECTIVE, in grammar, a kind of noun joined with a substantive, either expressed or implied, to show its qualities or accidents. See GRAMMAR.

ADIGE, a river in Italy, which taking its rise south of the lake Glace among the Alps, run south by Trent, then east by Verona in the territory of Venice, and falls into the gulph of Venice, north of the mouth of the Po.

ADJOURNMENT, the putting off a court, or other meeting, till another day. There is a difference between the adjournment and the prorogation of the parliament; the former not only being for a shorter time, but also done by the house itself; whereas the latter is an act of royal authority.

ADIPOSE, a term used by anatomists for any cell, membrane, &c. that is remarkable for its fatness.

ADIRBEITSAN, in geography, a province of Persia, in Asia, and part of the ancient Media. It is bounded on the N. by the province of Shirvan, on the S. by Irac-Agemi and Curdistan, on the E. by Gilan and the Caspian sea, and on the W. by Turcomania.

ADIT, in a general sense, the passage to, or entrance of, any thing.

Adit of a Mine, the hole, or aperture, whereby it is entered and dug, and by which the water and ores are carried away. The term amounts to the same with *cuniculus* or *drift*, and is distinguished from *air-shaft*. The adit is usually made on the side of a hill, towards the bottom thereof, about four, five, or six feet high, and eight wide, in form of an arch; sometimes cut in the rock, and sometimes supported with timber, so conducted as that the sole or bottom of the adit may answer to the bottom of the shaft, only somewhat lower, that the water may have a sufficient current to pass away without the use of the pump. Damps and the impurity of the air are the great impediments against driving adits above 20 or 30 fathoms, by reason of the necessity, in this case, of letting down air-shafts from the day to meet the adit, which are often very expensive, both on account of the great depth of mines, and the hardness of the mineral strata to be cut through. The best remedy against this is that practised in the coal-mines near Liege, where they work their adits without air-shafts: the manner of which is described by Sir Robert Moray. Vid. Phil. Trans. N° 5.

Adit of a Mine is sometimes used for the air-shaft itself, being a hole driven perpendicularly from the surface of the earth into some part of a mine, to give entrance to the air. To draw off the standing water in winter, in deep mines, they drive up an adit, or air-shaft, upon which the air disengages itself from the water, when it begins to run with such violence as produces a noise equal to the bursting of a cannon, dashes every thing in the way against the sides of the mine, and loosens the very rocks at a distance. Ibid. N° 26.

ADJUDICATION, implies the act of adjudging, or determining, a cause in favour of some person.

ADJUDICATION, in Scots law, the name of that action by which a creditor attaches the heritable estate of his debtor, or his debtor's heir, in order to appropriate it to himself, either in payment or security of his

debt; or that action by which the holder of an heritable right, labouring under any defect in point of form, may supply that defect.

Adjunct
Adlegation.

ADJUNCT, among philosophers, signifies something added to another, without being any necessary part of it. Thus water absorbed by cloth or a sponge, is an adjunct, but no necessary part of either of these substances.

ADJUNCT, in metaphysics, some quality belonging to either the body or mind, whether natural or acquired. Thus thinking is an adjunct of the mind, and growth an adjunct of the body.

ADJUNCT, in music, a word which is employed to denominate the connection or relation between the principal mode and the modes of its two-fifths, which, from the intervals that constitute the relation between them and it, are called its *adjuncts*.

ADJUNCT is also used to signify a colleague, or some person associated with another as an assistant.

Adjunct Gods, or *Adjuncts of the Gods*, among the Romans, were a kind of inferior deities, added as assistants to the principal ones, to ease them in their functions. Thus, to Mars was adjoined Bellona and Nemesis; to Neptune, Salacia; to Vulcan, the Cabiri; to the Good Genius, the Lares; to the Evil, the Lemures, &c.

ADJUNCTS, in rhetoric and grammar, signify certain words or things added to others, to amplify or augment the force of the discourse.

ADJUNCTS, or **ADJOINTS**, in the royal academy of sciences at Paris, denote a class of members, attached to the pursuit of particular sciences. The class of *Adjuncts* was created in 1716, in lieu of the *Eleves*: they are twelve in number; two for geometry, two for mechanics, two for astronomy, two for anatomy, two for chemistry, and two for botany. The *Eleves* not taken into this establishment were admitted on the foot of supernumerary *Adjuncts*.

ADJUTANT, in the military art, is an officer whose business it is to assist the major. Each battalion of foot and regiment of horse has an adjutant, who receives the orders every night from the brigade-major; which, after carrying them to the colonel, he delivers out to the serjeants. When detachments are to be made, he gives the number to be furnished by each company or troop, and assigns the hour and place of rendezvous. He also places the guards; receives, and distributes the ammunition to the companies, &c.; and, by the major's orders, regulates the prices of bread, beer, and other provisions. The word is sometimes used by the French for an *aid-du-camp*.

Adjutants-general, among the Jesuits, a select number of fathers, who resided with the general of the order, each of whom had a province or country assigned him, as England, Holland, &c. and their business was to inform the father-general of state-occurrences in such countries. To this end they had their correspondents delegated, emissaries, visitors, regents, provincials, &c.

ADJUTORIUM, a term used by physicians for any medicine in a prescription but the capital one.

ADLE-EGGS, such as have not received an impregnation from the semen of the cock.

ADLEGATION, in the public law of the German empire, a right claimed by the states of the empire of adjoin-

Adlocution adjoining plenipotentiaries, in public treaties and negotiations, to those of the emperor, for the transacting of matters which relate to the empire in general. In which sense *adlegation* differs from *legation*, which is the right of sending ambassadors on a person's own account.—Several princes and states of the empire enjoy the right of *legation*, who have not that of *adlegation*, and *vice versa*. The bishops, for instance, have the right of *adlegation* in the treaties which concern the common interest, but no right of *legation* for their own private affairs. The like had the duke of Mantua.—The emperor allows the princes of Germany the privilege of *legation*, but disputes that of *adlegation*. They challenge it as belonging to them *jure regni*, which they enjoy in common with the emperor himself.

ADLOCUTION, **ADLOCUTIO**, in antiquity, is chiefly understood of speeches made by Roman generals to their armies, to encourage them before a battle. We frequently find these adlocutions expressed on medals by the abbreviature **ADLOCUT. COH.**—The general is sometimes represented as seated on a tribunal, often on a bank or mount of turf, with the cohorts ranged orderly round him, in *manipuli* and *turmæ*. The usual formula in adlocutions was, *Fortis esset ac fidus*.

ADMANUENSES, in ancient law books, denote persons who swore by laying their hands on the book.—In which sense, *admanuenses* amount to the same with laymen; and stand opposed to clerks, who were forbid to swear on the book, their word being to be reputed as their oath; whence they were also denominated *fide digni*.

ADMEASUREMENT, **ADMENSURATIO**, in law, a writ which lies for the bringing those to reason, or mediocrity, who usurp more of any thing than their share. This writ lies in two cases; termed,

ADMEASUREMENT of Dower, *Admensuratio dotis*, where the widow of the deceased holds more from the heir, or his guardian, on account of her dower, than of right belongs to her. And,

ADMEASUREMENT of Pasture, *Admensuratio pasturæ*; this lies between those who have common of pastures appendant to their freehold, or common by vicinage, in case any of them surcharge the common with more cattle than they ought.

ADMINICLE, a term used chiefly in old law-books, to imply an aid, help, assistance, or support. The word is Latin, *adminiculum*; and derived from *adminiculator*, to prop or support.

ADMINICLE, in Scots law, signifies any writing or deed referred to by a party, in an action of law, for proving his allegations.

ADMINICULATOR, an ancient officer of the church, whose business it was to attend to and defend the cause of the widows, orphans, and others destitute of help.

ADMINISTRATION, in general, the government, direction, or management of affairs, and particularly the exercise of distributive justice; among ecclesiastics, it is often used to express the giving or dispensing the sacraments, &c.

ADMINISTRATION, is also the name given by the Spaniards in Peru to the staple magazine, or warehouse, established at Callao, a small town on the S. Sea, which is the port of Lima, the capital of that part of South America, and particularly of Peru. The foreign ships,

which have leave to trade along that coast, are obliged to unload here, paying 13 *per cent.* of the price they sell for, if the cargo be entire, and even 16 *per cent.* if otherwise; besides which, they pay 3 *per 1000*, duty, for consulship and some other small royal rights and claims.

ADMINISTRATOR, in law, he to whom the ordinary commits the administration of the goods of a person deceased, in default of an executor.—An action lies for, or against an administrator, as for, or against an executor; and he shall be accountable to the value of the goods of the deceased, and no farther:—unless there be waste, or other abuse chargeable on him. If the administrator die, his executors are not administrators; but the court is to grant a new administration.—If a stranger, who is neither administrator nor executor, take the goods of the deceased, and administer, he shall be charged, and sued as an executor, not as an administrator. The origin of administrators is derived from the civil law. Their establishment in England is owing to a statute made in the 31st year of Edw. III. Till then, no office of this kind was known beside that of executor: in case of a want of which, the ordinary had the disposal of goods of persons intestate, &c.

ADMINISTRATOR, in Scots law, a person legally empowered to act for another whom the law presumes incapable of acting for himself. Thus tutors or curators are sometimes styled *administrators in law* to pupils, minors, or fatuous persons. But more generally the term is used to imply that power which is conferred by the law upon a father over the persons and estates of his children during their minority. See **LAW**, N° clxi.

ADMINISTRATOR, is sometimes used for the president of a province; for a person appointed to receive, manage, and distribute, the revenues of an hospital or religious house; for a prince who enjoys the revenues of a secularized bishopric; and for the regent of a kingdom during a minority of the prince, or a vacancy of the throne.

ADMIRABILIS SAL, the same with **GLAUBER'S** salt. See **CHEMISTRY**, N° 124.

ADMIRAL, a great officer or magistrate, who has the government of a navy, and the hearing of all maritime causes.

Authors are divided with regard to the origin and denomination of this important officer, whom we find established in most kingdoms that border on the sea. But the most probable opinion is that of Sir Henry Spelman, who thinks, that both the name and dignity were derived from the Saracens, and, by reason of the holy wars, brought amongst us; for *admiral*, in the Arabian language, signifies a prince, or chief ruler, and was the ordinary title of the governors of cities, provinces, &c. and therefore they called the commander of the navy by that name, as a name of dignity and honour. And indeed there are no instances of admirals in this part of Europe before the year 1284, when Philip of France, who had attended St Lewis in the wars against the Saracens, created an admiral. Du Cange assures us, that the Sicilians were the first, and the Genoese the next, who gave the denomination of *Admiral* to the commanders of their naval armaments; and that they took it from the Saracen or Arabic *Emir*, a general name for every commanding officer. As for the exact time when the word was introduced amongst us, it is uncertain; some think it was in the reign of Edward I.

Admini-
strator
||
Admiral.

Admiral. Edward I. Sir Henry Spelman is of opinion that it was first used in the reign of Henry III. because neither the laws of Oleron made in 1266, nor Bracton, who wrote about that time, make any mention of it; and that the term *admiral* was not used in a charter in the eighth of Henry III. wherein he granted this office to Richard de Lacey, by these words *Maritimam Anglie*; but in the 56th year of the same reign, not only the historians, but the charters themselves, very frequently use the word *admiral*.

Anciently there were generally three or four admirals appointed in the English seas, all of them holding the office *durante bene placito*; and each of them having particular limits under their charge and government; as admirals of the fleet of ships, from the mouth of the Thames, northward, southward, or westward. Besides these, there were admirals of the Cinque Ports, as in the reign of Edward III. when one William Latimer was styled *admiralis quinque portuum*; and we sometimes find that one person has been admiral of the fleets to the southward, northward, and westward: but the title of *admiralis Anglie* was not frequent till the reign of Henry IV. when the king's brother had that title given him, which in all commissions afterwards was granted to the succeeding admirals. It may be observed, that there was a title above that of admiral of England, which was, *locum tenens regis super mare*, the king's lieutenant-general of the sea; this title we find mentioned in the reign of Richard II.—Before the use of the word *admiral* was known, the title of *custos maris* was made use of.

Lord High Admiral of England, in some ancient records called *capitanus maritimarum*, an officer of great antiquity and trust, as appears by the laws of Oleron, so denominated from the place they were made at by Richard I. The first title of *Admiral of England*, expressly conferred upon a subject, was given by patent of Richard II. to Richard Fitz-Allen, junr. Earl of Arundel and Surrey; for those who before enjoyed this office were simply termed *admirals*, though their jurisdiction seems at large, especially in the reign of Edward III. when the court of admiralty was first erected.

This great officer has the management of all maritime affairs, and the government of the royal navy, with power of decision in all maritime cases both civil and criminal: he judges of all things done upon or beyond the sea, in any part of the world; upon the sea-coasts, in all ports and havens, and upon all rivers below the first bridge from the sea. By him, vice-admirals, rear-admirals, and all sea-captains, are commissioned; all deputies for particular coasts, and coroners to view dead bodies found on the sea-coasts, or at sea: he also appoints the judges for his court of admiralty, and may imprison, release, &c. All ports and havens are *infra corpus comitatus*, and the admiral hath no jurisdiction of any thing done in them. Between high and low water-mark, the common-law and the high-admiral have jurisdiction by turns, one upon the water, and the other upon the land.

The lord-admiral has power, not only over the seamen serving in his ships of war, but over all other seamen, to arrest them for the service of the state; and, if any of them run away, without leave of the admiral, he hath power to make a record thereof, and certify the same to the sheriffs, mayors, bailiffs, &c. who shall cause them to be apprehended and imprisoned.

To the lord high-admiral belong all penalties and amercements of all transgressions at sea, on the sea-shore, in ports and havens, and all rivers below the first bridge, from the sea; the goods of pirates and felons condemned or enslaved, sea-wrecks, goods floating on the sea, or cast on the shore (not granted to lords of manors adjoining to the sea), and a share of lawful prizes; also all great fishes, commonly called *royal fishes*, except whales and sturgeons: to which add, a salary of 7000 l. a-year.

In short, this is so great an office, in point of trust, honour, and profit, that it has been usually given to princes of the blood, or the most eminent persons among the nobility. We have had no high admiral for some years; the office being put in commission, or under the administration of the lords commissioners of the admiralty, who by statute have the same power and authority as the lord high admiral.

Lord High Admiral of Scotland, one of the great officers of the crown, and supreme judge in all maritime cases within that part of Britain. See *LAW*, Part III. N° clvii. 15.

ADMIRAL, also implies the commander in chief of any single fleet or squadron; or, in general, any flag-officer whatever. The commander of a fleet carries his flag at the main-top-mast head.

Vice Admiral, is the commander of the second squadron, and carries his flag at the fore-top-mast head.

Rear Admiral, is the commander of the third squadron, and carries his flag at the mizen-top-mast head.

Vice Admiral, is also an officer appointed by the lords commissioners of the admiralty. There are several of these officers established in different parts of Great Britain, with judges and martials under them, for executing jurisdiction within their respective limits. Their decrees, however, are not final, an appeal lying to the court of admiralty in London.

ADMIRAL is also an appellation given to the most considerable ship of a fleet of merchantmen, or of the vessels employed in the cod-fishery of Newfoundland. This last has the privilege of choosing what place he pleases on the shore to dry his fish; gives proper orders, and appoints the fishing-places to those who come after him; and as long as the fishing-season continues, he carries a flag on his main-mast.

ADMIRAL, in zoology, the English name of a species of the voluta, a shell-fish belonging to the order of vermes testacea. See *VOLUTA*.

ADMIRALTY properly signifies the office of lord high-admiral, whether discharged by one single person, or by joint commissioners called *lords of the admiralty*.

Court of ADMIRALTY, is a sovereign court, held by the lord high-admiral, or lords of the admiralty, where cognizance is taken in all maritime affairs, whether civil or criminal.—All crimes committed on the high-seas, or on great rivers below the first bridge next the sea, are cognizable in this court only, and before which they must be tried by judge and jury. But in civil cases the mode is different, the decisions being all made according to the civil law. From the sentences of the admiralty-judge an appeal always lay, in ordinary course, to the king in chancery, as may be collected from statute 25 Hen. VIII. c. 19. which directs the appeal from the archbishop's courts to be determined by persons named in the king's commission, "like as in case"

Admiral, Admiralty.

Admiralty "case of appeal from the admiral-court." But this is also expressly declared by statute 8 Eliz. c. 5. which enacts, that upon an appeal made to the chancery, the sentence definitive of the delegates appointed by commission shall be final.

Appeals from the vice-admiralty courts in America, and our other plantations and settlements, may be brought before the courts of admiralty in England, as being a branch of the admiral's jurisdiction, tho' they may also be brought before the king in council. But in case of prize-vessels, taken in time of war, in any part of the world, and condemned in any courts of admiralty or vice-admiralty as lawful prize, the appeal lies to certain *commissioners of appeals* consisting chiefly of the privy council, and not to judges delegates. And this by virtue of divers treaties with foreign nations, by which particular courts are established in all the maritime countries of Europe for the decision of this question, Whether lawful prize or not? for this being a question between subjects of different states, it belongs entirely to the law of nations, and not to the municipal laws of either country, to determine it.

Court of ADMIRALTY in Scotland. See LAW, Part III. N° clvii. 15.

ADMIRALTY Islands, lie in about 2° 18' S. Lat. and 146° 44' E. Long. There are between 20 and 30 islands said to be scattered about here, one of which alone would make a large kingdom. Captain Carteret, who first discovered them, was prevented touching at them, although their appearance was very inviting, on account of the condition of his ship, and of his being entirely unprovided with the articles of barter which suit an Indian trade. He describes them as clothed with a beautiful verdure of woods, lofty and luxuriant, interspersed with spots that have been cleared for plantations, groves of cocoa nut-trees, and houses of the natives, who seem to be very numerous. The largest of these islands is 18 leagues long in the direction of east and west. The discoverer thinks it highly probable that these islands produce several valuable articles of trade, particularly spices, as they lie in the same climate and latitude as the Moluccas.

ADMONITION, in ecclesiastical affairs, a part of discipline much used in the ancient church. It was the first act, or step, towards the punishment or expulsion of delinquents. In case of private offences, it was performed, according to the evangelical rule, privately: in case of public offence, openly, before the church. If either of those sufficed for the recovery of the fallen person, all further proceedings in the way of censure ceased: if they did not, recourse was had to excommunication.

ADMONITIO Fustium, among the Romans, a military punishment, not unlike our whipping, only it was performed with vine-branches.

ADMORTIZATION, in the feudal customs, the reduction of the property of lands or tenements to mortmain. See MORTMAIN.

ADNATA, in anatomy, one of the coats of the eye, which is also called *conjunctiva* and *albuginea*.

ADNATA, is also used for any hair, wool, or the like, which grows upon animals or vegetables.

ADNATA, or *Adnascentia*, among gardeners, denote those off-sets, which, by a new germination under the earth, proceed from the lily, narcissus, hyacinth, and

other flowers, and afterwards grow to true roots. The French call them *cayeux*, "stalks."

ADNOUN, is used by some grammarians to express what we more usually call an Adjective.—The word is formed by way of analogy to adverb; in regard adjectives have much the same office and relation to nouns that adverbs have to verbs. Bishop Wilkins uses the word *adname* in another sense, viz. for what we otherwise call a preposition.

ADOLESCENCE, the state of growing youth; or that period of a person's age commencing from his infancy, and terminating at his full stature or manhood. The word is formed of the Latin *adolescere*, "to grow."—The state of adolescence lasts so long as the fibres continue to grow, either in magnitude or firmness. The fibres being arrived at the degree of firmness and tension sufficient to sustain the parts, no longer yield or give way to the efforts of the nutritious matter to extend them; so that their farther accretion is stopped, from the very law of their nutrition. Adolescence is commonly computed to be between 15 and 25, or even 30 years of age; though in different constitutions its terms are very different.—The Romans usually reckoned it from 12 to 25 in boys; and to 21 in girls, &c. And yet, among their writers, *juvenis* and *adolescens* are frequently used indifferently for any person under 45 years.

ADOLLAM, or **ODOLLAM** (anc. geog.), a town in the tribe of Judah, to the east of Eleutheropolis. David is said to have hid himself in a cave near this town (Bible).

ADON, a populous village in the province of Stuhl-Weissenberg, belonging to Hungary. It lies in a fruitful country, towards the river Danube. Long. 19. 20. Lat 47. 30.

ADONAI, one of the names of the Supreme Being in the Scriptures. The proper meaning of the word is *my lords*, in the plural number; as *Adoni* is *my lord*, in the singular. The Jews, who either out of respect, or superstition, do not pronounce the name of *Jehovah*, read *Adonai* in the room of it, as often as they meet with *Jehovah* in the Hebrew text. But the ancient Jews were not so scrupulous; nor is there any law which forbids them to pronounce the name of God. Calmet.

ADONIA, in antiquity, solemn feasts in honour of Venus, and in memory of her beloved Adonis. The Adonia were observed with great solemnity by most nations; Greeks, Phœnicians, Lycians, Syrians, Egyptians, &c. From Syria, they are supposed to have passed into India. The prophet Ezekiel * is understood to speak of them. They were still observed at Alexandria in the time of St Cyril; and at Antioch in that of Julian the Apostate, who happened to enter that city during the solemnity, which was taken for an ill omen. The Adonia lasted two days: on the first of which certain images of Venus and Adonis were carried, with all the pomp and ceremonies practised at funerals: the women wept, tore their hair, beat their breasts, &c. imitating the cries and lamentations of Venus for the death of her paramour. This lamentation they called *Adonia*. The Syrians were not contented with weeping, but gave themselves discipline, shaved their heads, &c. Among the Egyptians, the queen herself used to carry the image of Adonis in procession. St Cyril mentions an extraordinary ceremony practised by the Alexandrians: A letter was written to the women of Bybulus, to inform them that

Adonis,

Adnoun
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Adonia

* Ch. viii. 14.

Adonides,
Adonis

Adonis was found again: this letter was thrown into the sea, which (it was pretended) did not fail punctually to convey it to Bybulus in seven days; upon the receipt of which, the Byblian women ceased their mourning, sung his praises, and made rejoicings as if he were raised to life again: Or rather, according to Meursius, the two offices of mourning and rejoicing made two distinct feasts, which were held at different times of the year, the one six months after the other; Adonis being supposed to pass half the year with Proserpine, and half with Venus.—The Egyptian Adonia are said to have been held in memory of the death of Osiris; by others, of his sickness and recovery. Bishop Patrick dates their origin from the slaughter of the first-born under Moses.

ADONIDES, in botany, a name given to botanists who described or made catalogues of plants cultivated in any particular place.

ADONIS, son to Cinyras king of Cyprus, the darling of the goddess Venus: being killed by a wild boar in the Idalian woods, he was turned into a flower of a blood-colour, supposed to be the anemone. Venus was inconsolable; and no grief was ever more celebrated than this, most nations having perpetuated the memory of it by a train of anniversary ceremonies*. Among Shakespeare's poems, is a long one on the subject of Venus's affection for Adonis.

*See Adonia.

The text of the vulgate in Ezekiel, viii. 14. says, that this prophet saw women sitting in the temple, and weeping for Adonis: but, according to the reading of the Hebrew text, they are said to weep for Tammuz, or the *hidden one*. Among the Egyptians, Adonis was adored under the name of Osiris the husband of Isis. But he was sometimes called by the name of Ammuz, or Tammuz, *the concealed*, to denote probably his death or burial. The Hebrews, in derision, call him sometimes *the dead*, Psal. cvi. 28. and Lev. xix. 28. because they wept for him, and represented him as one dead in his coffin; and at other times, they call him the image of jealousy, Ezek. viii. 3. 5. because he was the object of the god Mars's jealousy. The Syrians, Phœnicians, and Cyprians called him Adonis; and F. Calmet is of opinion, that the Ammonites and Moabites gave him the name of Baal-peor. See BAAL-PEOR.

ADONIS, *Adonius* (anc. geog.); a river of Phœnicia, rising in mount Lebanon, and falling into the sea, after a north-west course, at Bybulus; famous in fable, as a beautiful shepherd-youth (Virgil); son of Cynaras, king of the Cyprians, loved by Venus, slain by a boar, and turned into a river. Theocritus laments him dead in an idyllion, or rather ode, as did the women yearly, when, in flood-time, the river rolled down a red earth, which tinged its waters, deemed to be his wound bleeding afresh. In the Phœnician language Adan signifies a willow, and Adon lord, with the same radical letters. Hence *Ἰταῖος Ἀδωνίς*, Salignus, and *Κυπρίος*, or *Κίπριος Ἀδωνίς*, for *Κυπρίος*. Adonidis horti, are gardens beautifully arranged, but more adapted for pleasure than profit.

ADONIS, *Bird's-eye*, or *Pheasant's-eye*; a genus of the polyandria order, belonging to the polygynia class of plants. It is associated with the *Multifloræ*, or 26th Nat. Order.—The characters are: The calyx is a perianthium, consisting of five obtuse concave leaves, somewhat coloured, and deciduous. The corolla

Nº 3.

has from five to fifteen oblong petals obtuse and glossy. The *stamina* consist of very numerous, short, subulated filaments; the antheræ are oblong and inflected. The *pistillum* has numerous germina collected in a head; no styli; the stigmata acute and reflected. There is no *pericarpium*; the receptacle is oblong and spiked. The seeds are numerous, irregular, angular, gibbous at the base, reflected at the top, somewhat prominent, and awnless.

Species. The most remarkable species are the following: 1. The annua, or common adonis, is a native of Kent, where it is found in great plenty in the fields sown with wheat. Its flowers are of a beautiful scarlet colour, and appear in the beginning of June; the seeds ripening in August and September. Great quantities of these flowers are sold in London, under the name of Red Morocco. 2. The æstivalis, or annual adonis, with yellow flowers, grows much taller than the first, has its leaves thinner set, and of a lighter colour. 3. The vernalis, or perennial adonis, grows naturally on the mountains of Bohemia, Prussia, and other parts of Germany. It flowers the latter end of March, or beginning of April; the stalks rise about a foot and a half high; and when the roots are large, and have stood unremoved for some years, they will put out a great number of stalks from each root; on the top of each of these grows one large yellow flower. 4. The apennina, is a native of Siberia and the Apennines.

Culture. The first two species, being annual, must be propagated from seeds, which ought to be sown in autumn, soon after they are ripe, or they will be in danger of not growing up that year. They thrive best in a light soil. The third and fourth species are likewise to be propagated from seeds, which must be sown in autumn, or they seldom succeed. When the plants come up, they must be carefully kept clear from weeds; and in very dry weather their growth will be promoted by being now and then watered. They should remain in the place where they are sown till the second year; and be transplanted thence in autumn, to the place where they are to remain.

ADONISTS, a sect or party among divines and critics, who maintain, that the Hebrew points ordinarily annexed to the consonants of the word Jehovah, are not the natural points belonging to that word, nor express the true pronunciation of it; but are the vowel-points, belonging to the words *Adonai* and *Elohim*, applied to the consonants of the ineffable name Jehovah; to warn the readers, that instead of the word Jehovah, which the Jews were forbid to pronounce, and the true pronunciation of which had been long unknown to them, they are always to read *Adonai*. They are opposed to *Jehovists*: of whom the principal are Drusius, Capellus, Buxtorf, Alting, and Reland, who has published a collection of their writings on this subject.

ADOPTIANI, in church-history, a sect of ancient heretics, followers of Felix of Urgel, and Elipand of Toledo, who, towards the end of the eighth century, advanced the notion, that Jesus Christ, in his human nature, is the son of God, not by nature, but by adoption.

ADOPTION, an act by which any one takes another into his family, owns him for his son, and appoints him for his heir.

The custom of adoption was very common among the ancient Greeks and Romans: yet it was not practised,

Adonists
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Adoption.

Adoption. tised, but for certain causes expressed in the laws, and with certain formalities usual in such cases. It was a sort of imitation of nature, intended for the comfort of those who had no children: wherefore he that was to adopt was to have no children of his own, and to be past the age of getting any; nor were eunuchs allowed to adopt, as being under an actual impotency of begetting children; neither was it lawful for a young man to adopt an elder, because that it would have been contrary to the order of nature: nay, it was even required that the person who adopted should be eighteen years older than his adopted son, that there might at least appear a probability of his being the natural father.

Among the Greeks it was called *υιοτης, filiation*. It was allowed to such as had no issue of their own; excepting those who were not *κυριοι εαυτων, their own masters*, e. g. slaves, women, madmen, infants, or persons under twenty years of age; who being incapable of making wills, or managing their own estates, were not allowed to adopt heirs to them. Foreigners being incapable of inheriting at Athens, if any such were adopted, it was necessary first to make them free of the city. The ceremony of adoption being over, the adopted had his name enrolled in the tribe and ward of his new father; for which entry a peculiar time was allotted, viz. the festival *Δαρρηνια*. To prevent rash and inconsiderate adoptions, the Lacedæmonians had a law, that adoptions should be transacted, or at least confirmed, in the presence of their kings. The children adopted were invested with all the privileges, and obliged to perform all the duties, of natural children; and being thus provided for in another family, ceased to have any claim of inheritance, or kindred, in the family which they had left, unless they first renounced their adoption; which, by the laws of Solon, they were not allowed to do, unless they had first begotten children, to bear the name of the person who had adopted them: thus providing against the ruin of families, which would otherwise have been extinguished by the desertion of those who had been adopted to preserve them. If the children adopted happened to die without children, the inheritance could not be alienated from the family into which they had been adopted, but returned to the relations of the adopter. It should seem, that by the Athenian law, a person, after having adopted another, was not allowed to marry without permission from the magistrate: in effect, there are instances of persons, who being ill used by their adoptive children, petitioned for such leave. However this be, it is certain some men married after they had adopted sons: in which case, if they begat legitimate children, their estates were equally shared between the begotten and adopted.

The Romans had two forms of adoption; one before the pretor; the other at an assembly of the people, in the times of the commonwealth, and afterwards by a rescript of the emperor. In the former, the natural father addressed himself to the pretor, declaring that he emancipated his son, resigned all his authority over him, and consented he should be translated into the family of the adopter. The latter was practised, where the party to be adopted was already free; and this was called *adrogation*. The person adopted changed all his names; assuming the prename, name, and surname, of the person who adopted him.

VOL. I. Part I.

Besides the formalities prescribed by the Roman law, various other methods have taken place; which have given denominations to different species of adoption, among the Gothic nations, in different ages. As,

ADOPTION by arms, was when a prince made a present of arms to a person, in consideration of his merit and valour. Thus it was that the king of the Heruli was adopted by Theodoric; Athalaric by the emperor Justinian; and Cosroes, nephew of the king of Persia, by the emperor Justin.—The obligation here laid on the adoptive son was, to protect and defend the father from injuries, affronts, &c. And hence, according to Selden, the ceremony of dubbing knights took its origin as well as name.

ADOPTION by baptism, is that spiritual affinity which is contracted by god-fathers and god children in the ceremony of baptism. This kind of adoption was introduced into the Greek church, and came afterwards into use among the ancient Franks, as appears by the Capitulars of Charlemagne.

In reality, the god-father was so far considered as adoptive father, that his god-children were supposed to be intitled to a share in the inheritance of his estate.

ADOPTION by hair, was performed by cutting off the hair of a person, and giving it to the adoptive father. It was thus that pope John VIII. adopted Boson king of Arles; which, perhaps, is the only instance in history, of adoption, in the order of the ecclesiastics; a law that professes to imitate nature, not daring to give children to those in whom it would be thought a crime to beget any.

ADOPTION by matrimony, is the taking the children of a wife or husband, by a former marriage, into the condition of proper or natural children; and admitting them to inherit on the same footing with those of the present marriage. This is a practice peculiar to the Germans; among whom, it is more particularly known by the name of *einkindschaft*; among their writers in Latin, by that of *unio prolium*, or *union of issues*. But the more accurate writers observe, that this is no adoption. See **ADFILIAION**.

ADOPTION by testament, that performed by appointing a person heir by will, on condition of his assuming the name, arms, &c. of the adopter. Of which kind we meet with several instances in the Roman history.

Among the Turks, the ceremony of adoption is performed by obliging the person adopted to pass through the shirt of the adopter. Hence, among that people, to adopt, is expressed by the phrase, *to draw another through my shirt*. It is said, that something like this has also been observed among the Hebrews; where the prophet Elijah adopted Elisha for his son and successor, and communicated to him the gift of prophecy, by letting fall his cloak or mantle on him. But adoption, properly so called, does not appear to have been practised among the ancient Jews: Moses says nothing of it in his laws; and Jacob's adoption of his two grandsons, Ephraim and Manasseh, is not so properly an adoption, as a kind of substitution, whereby those two sons of Joseph were allotted an equal portion in Israel with his own sons.

ADOPTION is also used, in theology, for a federal act of God's free grace; whereby those who are regenerated by faith, are admitted into his household, and intitled

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Adoption
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Adoration.

intitled to a share in the inheritance of the kingdom of heaven.

ADOPTION is sometimes also used, in speaking of the ancient clergy, who had a custom of taking a maid or widow into their houses, under the denomination of an *adoptive*, or *spiritual sister* or *niece*.

ADOPTION is also used in speaking of the admission of persons into certain hospitals, particularly that of Lyons; the administrators whereof have all the power and rights of parents over the children admitted.

ADOPTION is also used for the reception of a new academy into the body of an old one.—Thus

The French academy of Marseilles was adopted by that of Paris: on which account, we find a volume of speeches extant, made by several members of the academy of Marseilles, deputed to return thanks to that of Paris for the honour.

In a similar sense, adoption is also applied by the Greeks, to the admitting a monk, or brother, into a monastic community; sometimes called *spiritual adoption*.

ADOPTIVE, denotes a person or thing adopted by another.

Adoptive children, among the Romans, were on the same footing with natural ones; and accordingly were either to be instituted heirs, or expressly disinherited, otherwise the testament was null. The emperor Adrian preferred adoptive children to natural ones; because we choose the former, but are obliged to take the latter at random.

M. Menage has published a book of eloges, or verses addressed to him; which he calls *Liber Adoptivus*, an adoptive book; and adds it to his other works.—Heinsius, and Furstemburg of Munster, have likewise published adoptive books.

In ecclesiastical writers we find adoptive women, or sisters, (*adoptivæ feminae*, or *sorores*;) used for those handmaids of the ancient clergy, otherwise called *sub-introduktæ*.

ADOPTIVE arms, are those which a person enjoys by the gift or concession of another, and to which he was not otherwise intitled. They stand contradistinguished from arms of alliance.

We sometimes meet with adoptive hair, by way of opposition to natural hair; and adoptive gods, by way of contradistinction to domestic ones. The Romans, notwithstanding the number of their domestic, had their adoptive gods, taken chiefly from the Egyptians: such were Isis, Osiris, Anubis, Apis, Harpocrates, and Canopus.

ADORATION, the act of rendering divine honours; or of addressing a being, as supposing it a god. The word is compounded of *ad*, “to;” and *os*, *oris*, “mouth;” and literally signifies, to apply the hand to the mouth; *Manum ad os admove*, *q. d.* “to kiss the hand;” this being, in the eastern countries, one of the great marks of respect and submission.—The Romans practised adoration at sacrifices, and other solemnities; in passing by temples, altars, groves, &c.; at the sight of statues, images, or the like, whether of stone or wood, wherein any thing of divinity was supposed to reside. Usually there were images of the gods placed at the gates of cities, for those who went in or out, to pay their respects to.—The ceremony of adoration among the ancient Romans was thus: The devotee having his head covered, applied his right hand

to his lips, the fore-finger resting on his thumb, which was erect, and thus bowing his head, turned himself round from left to right. The kiss thus given was called *osculum labratum*; for ordinarily they were afraid to touch the images of their gods themselves with their profane lips. Sometimes, however, they would kiss their feet, or even knees, it being held an incivility to touch their mouths; so that the affair passed at some distance. Saturn, however, and Hercules, were adored with the head bare; whence the worship of the last was called *institutum peregrinum*, and *ritus Græcanicus*, as departing from the customary Roman method, which was to sacrifice and adore with the face veiled, and the cloths drawn up to the ears, to prevent any interruption in the ceremony by the sight of unlucky objects.—The Jewish manner of adoration was by prostration, bowing, and kneeling.—The Christians adopted the Grecian rather than the Roman method, and adored always *uncovered*. The ordinary posture of the ancient Christians was kneeling, but on Sundays standing: and they had a peculiar regard to the East, to which point they ordinarily directed their prayers.

ADORATION is more particularly used for the act of praying, or presenting our requests or thanksgivings to Almighty God.

ADORATION is also used for certain extraordinary civil honours or respects which resemble those paid to the deity, yet are given to men.

The Persian manner of adoration, introduced by Cyrus, was by bending the knee, and falling on the face at the prince's feet, striking the earth with the forehead, and kissing the ground. This ceremony, which the Greeks called *προσκύνησις*, Conon refused to perform to Artaxerxes, and Calisthenes to Alexander the Great, as repugnant to it impious and unlawful.

The adoration performed to the Roman and Grecian emperors consisted in bowing or kneeling at the prince's feet, laying hold of his purple robe, and presently withdrawing the hand and clapping it to the lips. Some attribute the origin of this practice to Constantius. It was only persons of some rank or dignity that were intitled to the honour. Bare kneeling before the emperor to deliver a petition, was also called *adoration*.

The practice of adoration may be said to be still subsisting in England, in the ceremony of kissing the king's or queen's hand, and in serving them at table, both being performed kneeling.

ADORATION is more particularly used for kissing one's hand in presence of another, as a token of reverence.—The Jews adored by kissing their hands and bowing down their heads; whence, in their language, *kissing* is properly used for *adoration*.

ADORATION is also used among Roman writers for a high species of applause given to persons, who had spoken or performed well in public. (See ACCLAMATION.) We meet with adoration paid to orators, actors, musicians, &c. The method of expressing it was, by rising, putting both hands to their mouth, and then returning them towards the person intended to be honoured.

ADORATION is also used, in the court of Rome, for the ceremony of kissing the pope's feet.—The introduction of adoration among the Romans is ascribed to the low flattery of Vitellius, who, upon the return of C. Cæsar from Syria, would not approach him otherwise than

Adoration than with his head covered, turning himself round, and then falling on his face. Heliogabulus restored the practice, and Alexander Severus again prohibited it. Dioclesian redemanded it; and it was, in some measure, continued under the succeeding princes, even after the establishment of Christianity, as Constantine, Constantius, &c. It is particularly said of Dioclesian, that he had gems fastened to his shoes, that divine honours might be more willingly paid him, by kissing his feet. The like usage was afterwards adopted by the popes, and is observed to this day. These prelates, finding a vehement disposition in the people to fall down before them and kiss their feet, procured crucifixes to be fastened on their slippers; by which stratagem, the adoration intended for the pope's person is supposed to be transferred to Christ. Divers acts of this adoration we find offered even by princes to the pope.

ADORATION is also used for a method of electing a pope. The election of popes is performed two ways; by *adoration* and by *scrutiny*. In election by adoration, the cardinals rush hastily, as if agitated by some spirit, to the adoration of some one among them, to proclaim him pope. When the election is carried by scrutiny, they do not adore the new pope till he is placed on the altar.

Barbarous ADORATION is a term used, in the laws of King Canute, for that performed after the manner of the heathens who adored idols. The Romish church is charged with the adoration of saints, martyrs, images, crucifixes, relics, the virgin, and the host; all which by Protestants are generally aggravated into idolatry, on a supposition, that the honour thus paid to them is absolute and supreme, called by way of distinction *Latria*, which is due only to God. Roman catholics, on the contrary, explain them, as only a relative or subordinate worship, called *Dulia* and *Hyperdulia*, which terminates ultimately in God alone. But may not the same be said of the idol-worship of the heathens? The Phœnicians adored the winds, on account of the terrible effects produced by them; the same was adopted by most of the other nations, Persians, Greeks, Romans, &c. The Persians chiefly paid their adorations to the sun and fire; some say also to rivers, the wind, &c. The motive of adoring the sun was the benefits they received from that glorious luminary, which of all creatures has doubtless the best pretensions to such homage.

ADOREA, in Roman antiquity, a word used in different senses; sometimes for all manner of grain, sometimes for a kind of cakes made of fine flour, and offered in sacrifice; and finally for a dole or distribution of corn, as a reward for some service; whence by metonymy it is put for praise or rewards in general.

ADOSCULATION, a term used by Dr Grew, to imply a kind of impregnation, without intromission; and in this manner he supposes the impregnation of plants is effected by the falling of the farina fecundans on the pistil.

ADOSEE, in heraldry, signifies two figures or bearings being placed back to back.

ADOUR, the name of a river of France, which rises in the mountains of Bigorre, and running N. by Tarbes through Gascony, afterwards turns E. and passing by Dax, falls into the bay of Biscay, below Bayonne.

ADOXA, *TUBEROUS MOSCHATEL*, *HOLLOW-*

ROOT, or INGLORIOUS A genus of the tetragynia order, belonging to the octandria class of plants; and in the natural method ranking under the 13th order, *Succulentæ*. The characters of this genus are: The *calyx* is a perianthium beneath, divided into two segments, flat, persistent. The *corolla* is composed of one flat petal, divided into four ovate acute segments longer than the calyx. The *stamina* consist of eight subulated filaments the length of the calyx; with roundish antheræ. The *pistillum* has a germen beneath the receptacle of the corolla; four simple, erect, persistent styli, the length of the stamina; and simple stigmata. The *pericarpium* is a globular four-celled berry between the calyx and corolla. The *seeds* are solitary and compressed.

There is but one species, which is a native of the woods in Britain, and several parts of Europe: it is a very low plant, seldom rising more than four or five inches high; the leaves resemble those of bulbous fumitory; the flower-stalk arises immediately from the root, on the top of which grow four or five small flowers of an herbaceous white colour, which appear in the beginning of April, and the berries ripen in May; soon after which, the leaves decay. The herb may be procured by transplanting roots any time after the leaves decay, till winter. They must be planted in the shade, under shrubs; for they will not thrive if exposed to the sun. The leaves and flowers smell like musk, from whence it has by some been called *musk-crowfoot*.

AD PONDUS OMNIUM, among physicians, an abbreviation in their prescriptions, signifying that the last mentioned ingredient is to weigh as much as all the rest together.

Ad Quod Damnum, in the English law, a writ directed to the sheriff, commanding him to inquire into the damage which may befall from granting certain privileges to a place, as a fair, a market, or the like.

ADRACHNE, in botany, a species of the strawberry-tree. See *ARBUTUS*.

ADRAMMELECH, one of the gods of the inhabitants of Sepharvaim, who were settled in the country of Samaria, in the room of those Israelites who were carried beyond the Euphrates. The Sepharvaites made their children pass through the fire, in honour of this idol and another called *Anamelech*. It is supposed, that Adrammelech meant the sun, and Anamelech the moon: the first signifies *the magnificent king*; the second *the gentle king*.

ADRAMYTTIUM (anc. geog.), now *Andramiti*; a town of Mysia Major, at the foot of mount Ida, an Athenian colony, with a harbour and dock near the Caicus. *Adramyttenus* the epithet; as, *Adramyttenus Sinus*, a part of the Egean Sea, on the coast of Mysia; *Adramyttenus Convenus*, sessions or assizes. The eighth in order of the nine *Conventus Juridici* of the province of Asia.

ADRANA, a river of Germany, (Polybius); now the Eder, rising on the borders of the county of Nassau, to the north-east of, and not far from Dillenburg, running through the landgraviate of Hesse, the county of Waldeck, by Fritzlar, and then again through the landgraviate, and, together with the Fulda, falling into the Weser, to the south of, and not far from Cassel.

ADRANUM, or *HADRANUM*, (anc. geog.), now *Aderno*; a town of Sicily, built by the elder Dionysius,

*Ad Pondus
Omniun
||
Adranum.*

Adraſtea at the foot of mount *Ætna*, (Diodorus Siculus), four hundred years before Chriſt. So called from the temple of *Adranus*, or *Hadranus*, a god much worſhipped by the Sicilians; with a river of the ſame name, (Stephanus); now *Fiume d'Aderno*. The inhabitants, *Hadranitani*, and *Adraniti*.

Adrianum.

ADRASTEIA, in antiquity, an epithet given to the goddess *Nemefis*, or *Revenge*. It was taken from king *Adraſtus*, who firſt erected a temple to that deity.

ADRASTIA Certamina, in antiquity, a kind of Pythian games, inſtituted by *Adraſtus* king of *Argos*, in the year of the world 2700, in honour of *Apollo*, at *Sicyon*. Theſe are to be diſtinguiſhed from the Pythian games celebrated at *Delphi*.

ADRASTUS, king of *Argos*, ſon of *Talaus* and *Lyſianiffa*, daughter of *Polybius* king of *Sicyon*, acquired great honour in the famous war of *Thebes*, in ſupport of *Polynices* his ſon-in-law, who had been excluded the ſovereignty of *Thebes* by *Eteocles* his brother, notwithſtanding their reciprocal agreement. *Adraſtus*, followed by *Polynices* and *Tydeus* his other ſon-in-law, by *Capaneus* and *Hippomedon* his ſiſter's ſons, by *Amphiarus* his brother-in-law, and by *Parthenopæus*, marched againſt the city of *Thebes*; and this is the expedition of the *Seven Worthies*, which the poets have ſo often ſung. They all loſt their lives in this war except *Adraſtus*, who was ſaved by his horſe called *Arian*. This war was revived ten years after by the ſons of thoſe deceased warriors, which was called the war of the *Epigones*, and ended with the taking of *Thebes*. None of them loſt their lives except *Ægialeus* ſon of *Adraſtus*; which afflicted him ſo much that he died of grief in *Megara*, as he was leading back his victorious army.

ADRAZZO, or **AJACCIO**. The ſame with **ADJAZZO**.

ADRIA, or **HADRIA** (anc. geog.), the name of two towns in Italy. One in the country of the *Veneti*, on the river *Tartarus*, between the *Padus* and the *Athieſis*, called *Atria* by *Pliny* and *Ptolemy*, but *Adrias* by *Strabo*. Another on the river *Vomanus*, in the territory of the *Piceni* (to which *Antonine's Itinerary* from *Rome* is directed), the country of the anceſtors of the emperor *Adrian*. From which of theſe the *Adriatic ſea* is denominated, is matter of doubt. A third opinion is, that it is ſo called from *Adrias* the ſon of *Joan*, of Italian origin; (*Euſtathius* in *Dionyſium*).

ADRIANUM (or **ADRIATICUM**) **MARE** (anc. geog.), now the gulf of *Venice*, a large bay in the *Mediterranean*, between *Dalmatia*, *Sclavonia*, *Greece*, and *Italy*. It is called by the *Greeks* *Ἀδριακὸς Κόλπος*; and *Adria* by the *Romans*, (as *Arbiter Adriæ Notus*, *Hor.*) *Cicero* calls it *Hadrianum Mare*; *Virgil* has *Hadriaticas Undas*. It is commonly called *Mare Adriaticum*, without an aſpiration; but whether it ought to have one, is a diſpute: if the appellation is from *Hadria*, the town of the *Piceni*, it muſt be written *Hadriaticum*, becauſe the emperor's name, who thence derives his o-

origin, is on coins and ſtones *Hadrianus*; but if from the town in the territory of *Venice*, as the more ancient, and of which that of the *Piceni* is a colony, this will juſtify the common appellation *Adriaticum*.

ADRIAN, or **HADRIAN**, (*Publius Ælius*), the Roman emperor. He was born at *Rome* the 24th of *January*, in the 76th year of Chriſt. His father left him an orphan, at ten years of age, under the guardianship of *Trajan*, and *Cœlius Tatianus* a Roman knight. He began to ſerve very early in the armies, having been tribune of a legion before the death of *Domitian*. He was the perſon choſen by the army of *Lower Mœſia*, to carry the news of *Nerva's* death to *Trajan*, ſucceſſor to the empire. He accompanied *Trajan* in moſt of his expeditions, and particularly diſtinguiſhed himſelf in the ſecond war againſt the *Daci*; and having before been quaſtor, as well as tribune of the people, he was now ſucceſſively prætor, governor of *Pannonia*, and conſul. After the ſiege of *Atra* in *Arabia* was raiſed, *Trajan*, who had already given him the government of *Syria*, left him the command of the army: and at length, when he found death approaching, it is ſaid he adopted him. *Adrian*, who was then in *Antiochia*, as ſoon as he received the news thereof, and of *Trajan's* death, declared himſelf emperor, on the 11th of *Auguſt*, 117. No ſooner had he arrived at the imperial dignity, than he made peace with the *Perſians*, to whom he yielded up great part of the conqueſts of his predeceſſors; and from generoſity, or policy, he remitted the debts of the Roman people, which, according to the calculation of thoſe who have reduced them to modern money, amounted to 22,500,000 golden crowns; and he burnt all the bonds and obligations relating to thoſe debts, that the people might be under no apprehenſion of being called to an account for them afterwards. There are medals in commemoration of this fact, in which he is repreſented holding a flambeau in his hand, to ſet fire to all thoſe bonds which he had made void. He went to viſit all the provinces; and did not return to *Rome* till the year 118, when the ſenate decreed him a triumph, and honoured him with the title of *Father of his country*; but he reſuſed both, and deſired that *Trajan's* image might triumph. No prince travelled more than *Adrian*; there being hardly one province in the empire which he did not viſit. In 120 he went into *Gaul*; from thence he went over to *Britain*, in order to ſubdue the *Caledonians*, who were making continual inroads into the provinces. Upon his arrival they retired towards the north: he advanced however as far as *York*, where he was diverted from his intended conqueſt by the deſcription ſome old ſoldiers he found there, who had ſerved under *Agricola*, gave him of the country. In hopes, therefore, of keeping them quiet by enlarging their bounds, he delivered-up to the *Caledonians* all the lands lying between the two *Friths* and the *Tyne*; and at the ſame time, to ſecure the Roman province from their future incurſions, built the famous wall which ſtill bears his name (A). Having thus ſettled

(A) This work, though called by the Roman hiſtorians *murus*, which ſignifies a wall of ſtone, was only compoſed of earth covered with green turf. It was carried on from the *Solway Frith*, a little weſt of the village of *Burgh* on the *Sands*, in as direct a line as poſſible, to the river *Tyne* on the eaſt, at the place where the

Adrian. tled matters in Britain, he returned to Rome, where he was honoured with the title of Restorer of Britain, as appears by some medals. He soon after went into Spain, to Mauritania, and at length into the East, where he quieted the commotions raised by the Parthians. After having visited all the provinces of Asia, he returned to Athens in 125, where he passed the winter, and was initiated in the mysteries of Eleusinian Ceres. He went from thence to Sicily, chiefly to view mount *Ætna*, contemplate its phenomena, and enjoy the beautiful and extensive prospect afforded from its top. He returned to Rome the beginning of the year 129; and, according to some, he went again, the same year, to Africa; and, after his return from thence, to the East. He was in Egypt in the year 132, revisited Syria the year following, returned to Athens in 134, and to Rome in 135. The persecution against the Christians was very violent under his reign; but it was at length suspended, in consequence of the remonstrances of Quadrat bishop of Athens, and Aristides, two Christian philosophers, who presented the emperor with some books in favour of the Christian religion. He conquered the Jews; and, by way of insult, erected a temple to Jupiter on Calvary, and placed a statue of Adonis in the manner of Bethlehem; he caused also the images of swine to be engraven on the gates of Jerusalem. At last he was seized with a dropsy, which vexed him to such a degree, that he became almost raving mad. A great number of physicians were sent for, and to the multitude of them he ascribed his death. He died at Baizæ in the 63d year of his age, having reigned 21 years. The Latin verses (B) he addressed to his soul have been much criticised and variously interpreted. There are some fragments of his Latin poems extant, and there are Greek verses of his in the Anthology. He also wrote the history of his own life: to which, however, he did not chuse to put his name; but that of Phlegon, one of his freed-men, a very learned person, was prefixed to it*. He had great wit, and an extensive me-

*Vide *Spartian, in Adriano.*

Adrian. mory. He understood the sciences perfectly well; but was very jealous of others who excelled in them. He was also cruel, envious, and lascivious. Antonious his successor obtained his apotheosis; and prevented the rescission of his acts, which the senate once intended.

ADRIAN IV. (Pope), the only Englishman who ever had the honour of sitting in the papal chair. His name was Nicholas Brekspere; and he was born at Langley, near St Alban's, in Hertfordshire. His father having left his family, and taken the habit of the monastery of St Alban's, Nicholas was obliged to submit to the lowest offices in that house for daily support. After some time, he desired to take the habit in that monastery, but was rejected by the abbot Richard. Upon this he resolved to try his fortune in another country, and accordingly went to Paris; where, though in very poor circumstances, he applied himself to his studies with great assiduity, and made a wonderful proficiency. But having still a strong inclination to a religious life, he left Paris, and removed to Provence, where he became a regular clerk in the monastery of St Rufus. He was not immediately allowed to take the habit; but passed some time, by way of trial, in recommending himself to the monks by a strict attention to all their commands. This behaviour, together with the beauty of his person, and prudent conversation, rendered him so acceptable to those religious, that after some time they intreated him to take the habit of the canonical order. Here he distinguished himself so much by his learning and strict observance of the monastic discipline, that, upon the death of the abbot, he was chosen superior of that house; and we are told that he rebuilt that convent. Pope Eugenius III. being apprised of the great merit of Nicholas, and thinking he might be serviceable to the church in a higher station, created him cardinal-bishop of Alba in 1146. In 1148, his Holiness sent him legate to Denmark and Norway; where, by his fervent preaching and diligent instructions, he converted those barbarous nations to the Christian faith; and erected Up-

sal:

the town of Newcastle now stands; so that it must have been above 60 English, and near 70 Roman miles in length. It consisted of four parts: 1. The principal *agger*, mound of earth, or rampart, on the brink of the ditch. 2. The ditch on the north side of the rampart. 3. Another rampart on the south side of the principal one, about five paces distant from it. 4. A large rampart on the north side of the ditch.—This last was probably the military way to the line of forts on this work: it was so to those formerly built by Agricola; and if it did not serve the same purpose in this, there must have been no military way attending it.—The south rampart might serve for an inner defence in case the enemy should beat them from any part of the principal rampart, or it might be designed to protect the soldiers from any sudden attack of the provincial Britons.—For many ages, this work hath been in so ruinous a condition, that it is impossible to discover its original dimensions with certainty. From their appearance, it seems probable that the principal rampart was at least 10 or 12 feet high, and the south one not much less; but the north one was considerably lower. From the dimensions of the ditch taken as it passes through a lime-stone quarry near Harlow-hill, it appears to have been 9 feet deep, and 11 wide at the top, but somewhat narrower at the bottom. The north rampart was about 20 feet distant from the ditch.

(B) The verses are these:

Animula vagula, blandula,
Hospes, comesque corporis,
Quæ nunc abibis in loca
Pallidula, rigida, nudula,
Nec, ut soles, dabis jocos?

Thus translated by Mr Pope:

Ah! fleeting spirit! wand'ring fire,
That long hast warm'd my tender breast,
Must thou no more this frame inspire?
No more a pleasing cheerful guest?
Whither, ah whither art thou flying?
To what dark undiscover'd shore?
Thou seem'st all trembling, shiv'ring, dying,
And wit and humour are no more!

Adrian. sal into an archiepiscopal see. When he returned to Rome, he was received by the pope and cardinals with great marks of honour: and pope Anastasius, who succeeded Eugenius, happening to die at this time, Nicholas was unanimously chosen to the holy see, in November 1154, and he took the name of *Adrian*. When the news of his promotion reached England, king Henry II. sent Robert abbot of St Alban's, and three bishops, to Rome, to congratulate him on his election; upon which occasion Adrian granted very considerable privileges to the monastery of St Alban's, particularly an exemption from all episcopal jurisdiction, excepting to the see of Rome. Adrian, in the beginning of his pontificate, boldly withstood the attempts of the Roman people to recover their ancient liberty under the consuls, and obliged those magistrates to abdicate their authority, and leave the government of the city to the pope. In 1155, he drove the heretic Arnaud of Bresse, and his followers, out of Rome. The same year he excommunicated William king of Sicily, who ravaged the territories of the church, and absolved that prince's subjects from their allegiance. About the same time, Frederic king of the Romans, having entered Italy with a powerful army, Adrian met him near Sutrium, and concluded a peace with him. At this interview, Frederic consented to hold the pope's stirrup whilst he mounted on horseback. After which, his holiness conducted that prince to Rome, and in St Peter's church placed the imperial crown on his head, to the great mortification of the Roman people, who assembled in a tumultuous manner, and killed several of the Imperialists. The next year a reconciliation was brought about between the pope and the Sicilian king, that prince taking an oath to do nothing farther to the prejudice of the church, and Adrian granting him the title of *king of the two Sicilies*. He built and fortified several castles, and left the papal dominions in a more flourishing condition than he found them. But notwithstanding all his success, he was extremely sensible of the disquietudes attending so high a station; and declared to his countryman John of Salisbury, that all the former hardships of his life were mere amusement to the misfortunes of the popedom: that he looked upon St Peter's chair to be the most uneasy seat in the world; and that his crown seemed to be clapped burning on his head*. He died September 1st 1159, in the fourth year and tenth month of his pontificate; and was buried in St Peter's church, near the tomb of his predecessor Eugenius. There are extant several letters, and some homilies, written by pope Adrian.

* Baronius
Annal. tom.
xii. an. 1154

ADRIAN, cardinal-priest, of the title of St Chrysogonus, was a native of Cornetto in Tuscany. Innocent VIII. sent him nuncio into Scotland and into France; and after he had been clerk and treasurer of the apostolic chamber, pope Alexander VI. whose secretary he had been, honoured him with the cardinal's hat. His life was a continued scene of odd alterations. He narrowly escaped death the day Alexander VI. poisoned himself by mistake. Afterward he drew upon himself the hatred of Julius II. so that he was obliged to go and hide himself in the mountains of Trent. Having been recalled by Leo X. he was so ungrateful, that he engaged in a conspiracy against him. The pope pardoned his fault: but the cardinal, not caring to trust to

this, made his escape, and it could never be known exactly what was become of him. He was one of the first that effectually reformed the Latin style. He studied Cicero with great success, and made many excellent observations on the propriety of the Latin tongue. The treatise he composed *De sermone Latino*, is a proof of this. He had begun a Latin translation of the Old Testament. He wrote *De vera philosophia*: This treatise was printed at Cologne 1548.

ADRIAN VI. (Pope), was born at Utrecht in 1459. His father was not able to maintain him at school, but he got a place at Louvain, in a college in which a certain number of scholars were maintained *gratis*. It is reported that he used to read in the night-time by the light of the lamps in the churches or streets. He made a considerable progress in all the sciences; led an exemplary life; and there never was a man less intriguing and forward than he was. He took his degree of doctor of divinity at Louvain; was soon after made canon of St Peter's, and professor of divinity at Utrecht, and then dean of St Peter's and vice-chancellor of the university. He was obliged to leave an academical life, to be tutor to the archduke Charles. This young prince made no great progress under him: however, never was a tutor more considerably rewarded; for it was by Charles V.'s credit he was raised to the papal throne. Leo X. had given him the cardinal's hat in 1517. After this pope's death, several cabals in the conclave ended in the election of Adrian, with which the people of Rome were very much displeased. He would not change his name, and in every thing he showed a great dislike for all ostentation and sensual pleasures, though such an aversion had been long ago out of date. He was very partial to Charles V. and did not enjoy much tranquillity under the triple crown. He lamented much the wicked morals of the clergy, and wished to establish a reformation of manners among them. He died September 14th 1523.

ADRIANI (Joanni Battista), was born of a patrician family at Florence in 1511. He wrote a History of his own Times in Italian; which is a continuation of Guicciardini, beginning at the year 1536; to which Thuanus acknowledges himself greatly indebted: beside which, he composed six funeral orations, on the emperor Charles V. and other noble personages; and is thought to have been the author of a long letter on ancient painters and sculptors, prefixed to the third volume of Vasari. He died at Florence in 1579.

ADRIANISTS, in ecclesiastical history, a sect of heretics divided into two branches; the first were disciples of Simon Magus, and flourished about the year 34. Theodoret is the only person who has preserved their name and memory; but he gives us no account of their origin. Probably this fact, and the six others which sprung from the Simonians, took their name from the particular disciples of Simon. The second were the followers of Adrian Hamstead the anabaptist; and held some particular errors concerning Christ.

ADRIANOPOLE, a city of Turkey in Europe, in the province of Romania, and the see of an archbishop under the patriarch of Constantinople. It is about seven or eight miles in circumference, including the old city and some gardens. The houses are low, mostly built of mud and clay, and some of brick: and the streets

Adrian
||
Adrianople

Adrogation staets are exceeding dirty. The walls and towers are in a great measure fallen to decay. However, there is a beautiful bazar, or market, half a mile long, called Ali Bassa. It is a vast arch building, with six gates, and 365 well-furnished-shops, kept by Turks, Armenians, and Jews, who pay five crowns a-month for each shop. The number of inhabitants of all nations and religions may be about 100,000; but it is dear living here, because the provisions are brought from distant places. The air is wholesome, and the country very pleasant in the summer-time, on account of the river and streams that run near and about the city; the chief of which is the Mariza. These promote and preserve the verdure of the gardens, meadows, and fields, for a considerable part of the year. In the winter there is plenty of game. Near the principal bazar there is another, about a mile in length, covered with boards, with holes on each side to let in the light. It is full of good shops, which contain all kinds of commodities. Sultan Selim's mosque stands on the side of a hill, in the midst of the city; and hence this magnificent structure may be seen on all sides. Every thing made of gold and silver, jewels, pistols, scimitars, &c. are sold in another part of the city, called by travellers the *bizestein*, though it differs little from a bazar. This contains about 200 shops, and is covered like the former: but the covering is supported by two rows of large pillars. The grand visier's palace is nothing more than a convenient house, after the Turkish manner of building. The emperor's seraglio is a regular structure, in a plain near the river Tungia. It is two miles in compass, and has seven gates, besides those of the gardens, which are several miles in circumference. The city is governed by a mullah cadi, who has an absolute authority both in civil and criminal matters. In the time of the plague, or war, the grand signior sometimes resides here. The Turks took this city from the Greeks in 1362, and made it the capital of the empire, till Mahomet II. took Constantinople in 1453. E. Long. 26. 27. Lat. 41. 41.

ADROGATION, in Roman antiquities, a species of adoption, whereby a person who was capable of choosing for himself was admitted by another into the relation of a son. The word is compounded of *ad*, "to," and *rogare*, "to ask;" on account of a question put in the ceremony of it, Whether the adopter would take such a person for his son? and another to the adoptive, Whether he consented to become such a person's son?

ADSIDELLA, in antiquity, the table at which the flamens sat during the sacrifices.

ADSTRICITION, among physicians, a term used to denote the rigidity of any part.

ADUACA, or **ATUACA**, anciently a large and famous city of the Tungri; now a small and inconsiderable village, called *Tongerren*, in the bishopric of Liege, to the north-west of the city of Liege, in the territory of Haspengow, on the rivulet Jecker, that soon after falls into the Maese. E. Long. 5. 52. Lat. 50. 54.

ADVANCE, in the mercantile style, denotes money paid before goods are delivered, work done, or business performed.

ADVANCED, in a general sense, denotes something posted or situated before another. Thus,

ADVANCED Ditch, in fortification, is that which surrounds the glacis or esplanade of a place.

ADVANCED Guard, or **Vanguard**, in the art of war, the first line or division of an army, ranged or marching in order of battle; or, it is that part which is next the enemy, and marches first towards them.

Advanced Guard, is more particularly used for a small party of horse stationed before the main guard.

ADVANCER, among sportsmen, one of the starts or branches of a buck's attire, between the back antler and the palm.

ADUAR, in the Arabian and Moorish customs, a kind of ambulatory village, consisting of tents, which these people remove from one place to another, as suits their conveniency.

ADVENT, in the calendar, properly signifies the approach of the feast of the nativity. It includes four Sundays, which begins on St Andrew's day, or on the Sunday before or after it. During advent, and to the end of the octaves of epiphany, the solemnizing of marriage is forbid without a special licence. It is appointed to employ the thoughts of Christians on the first advent or coming of Christ in the flesh, and his second advent or coming to judge the world. The primitive Christians practised great austerity during this season.

ADVENTREM INSPICIENDUM, in law, a writ by which a woman is to be searched whether she be with child by a former husband, on her withholding of lands from the next, failing issue of her own body.

ADVENTURE, in a general sense, some extraordinary or accidental event. It also denotes a hazardous or difficult undertaking.

Bill of ADVENTURE, among merchants, a writing signed by a merchant, testifying the goods mentioned in it to be shipped on board a certain vessel belonging to another person, who is to run all hazards; the merchant only obliging himself to account to him for the produce.

ADVENTURE-Bay, in Van Diemen's land. There is a beautiful sandy beach, about two miles long, at the bottom of Adventure Bay, formed to all appearance by the particles which the sea washes from a fine white sand-stone. This beach is very well adapted for hauling a seine. Behind it is a plain, with a brackish lake, out of which we caught, by angling, some bream and trout. The parts adjoining the bay are mostly hilly, and are an entire forest of tall trees, rendered almost impassable by brakes of fern, shrubs, &c. The soil on the flat land, and on the lower part of the hills, is sandy, or consists of a yellowish earth, and in some parts of a reddish clay; but further up the hills, it is of a grey tough cast. This country, upon the whole, bears many marks of being very dry, and the heat appears to be great. No mineral bodies, nor stones of any other kind than the white sand-stone, were observed by the late navigators; nor could they find any vegetables that afforded subsistence for man. The forest-trees are all of one kind, and generally quite straight: they bear clusters of small white flowers. The principal plants observed, are wood-forrel, milk-wort, cudweed, bell-flower, gladiolus, samphire, and several kinds of fern: the only quadruped, a species of opossum, about twice the size of a large rat. The kangaroo, found further northward in New Holland, may also be supposed to inhabit here, as some of the inhabitants had pieces of the skin of that animal.

Adventurer

||
Adver-
fative.

The principal sorts of birds in the woods are brown hawks or eagles, crows, large pigeons, yellowish paroquets, and a species which they called *motacilla cyanea*, from the beautiful azure colour of its head and neck. On the shore were several gulls, black oyster-catchers, or sea-pies, and plovers of a stone-colour.

The inhabitants seemed mild and cheerful, with little of that wild appearance that savages in general have. They are almost totally devoid of personal activity or genius, and are nearly upon a par with the wretched natives of Terra del Fuego. They display, however, some contrivance in their method of cutting their arms and bodies in lines of different directions, raised above the surface of the skin. Their indifference for presents, their general inattention, and want of curiosity, were very remarkable, and testified no acuteness of understanding. Their complexion is a dull black, which they sometimes heighten by smutting their bodies, as was supposed, from their leaving a mark behind on any clean substance. Their hair is perfectly woolly, and is clotted with grease and red ochre, like that of the Hottentots. Their noses are broad and full, and the lower part of the face projects considerably. Their eyes are of a moderate size, and though they are not very quick or piercing, they give the countenance a frank, cheerful, and pleasing cast. Their teeth are not very white, nor well set, and their mouths are too wide: they wear their beards long, and clotted with paint. They are, upon the whole, well proportioned, though their belly is rather protuberant. Their favourite attitude is to stand with one side forward, and one hand grasping, across the back, the opposite arm, which, on this occasion, hangs down by the side that projects.

ADVENTURER, in a general sense, denotes one who hazards something.

ADVENTURERS, is particularly used for an ancient company of merchants and traders, erected for the discovery of lands, territories, trades, &c. unknown. The society of adventurers had its rise in Burgundy, and its first establishment from John duke of Brabant in 1248, being known by the name of *The brotherhood of St Thomas à Becket*. It was afterwards translated into England, and successively confirmed by Edward III. and IV. Richard III. Henry IV. V. VI. and VII. who gave it the appellation of *Merchant Adventurers*.

ADVERB, in grammar, a particle joined to a verb, adjective, or participle, to explain their manner of acting or suffering; or to mark some circumstance or quality signified by them. The word is formed from the prepositions *ad*, "to," and *verbum*, "a verb;" and signifies literally a word joined to a verb, to show how, when, or where, one is, does, or suffers; as, the boy paints *neatly*, writes *ill*; the house stands *there*, &c. See GRAMMAR.

ADVERSARIA, among the ancients, a book of accounts, not unlike our journals or day-books. It is more particularly used for a kind of common-place-book. See COMMON-PLACE-BOOK.

ADVERSATIVE, in grammar, a word expressing some difference between what goes before and what follows it. Thus, in the phrase, *he is an honest man, but a great enthusiast*, the word *but* is an adversative conjunction.

No. 4.

ADVERSATOR, in antiquity, a servant who attended the rich in returning from supper, to give them notice of any obstacles in the way, at which they might be apt to stumble.

ADVERTISEMENT, in a general sense, denotes any information given to persons interested in an affair; and is more particularly used for a brief account of an affair inserted in the public papers, for the information of all concerned.

ADULA (anc. geog.), a mountain in Rhætia, or the country of the Gailons, part of the Alps, in which are the fountains of the Rhine; now *St Godhards*.

ADULE, or ADULIS (anc. geog.), a town of Egypt built by fugitive slaves, distant from its port on the Red Sea 20 stadia. Pliny calls the inhabitants *Adulitae*. The epithet is either *Adulitanus*; as, *Monumentum Adulitanum*, on the pompous inscription of the statue of Ptolemy Euergetes, published by Leo Alatus at Rome in 1631, and to be found in Spon and Thevenot: Or, *Adulicus*; as *Adulicus Sinus*, a part of the Red Sea.

ADULT, an appellation given to any thing that is arrived at maturity: Thus we say, an adult person, an adult plant, &c. Among civilians, it denotes a youth between 14 and 25 years of age.

ADULTERER, a man who commits adultery. See ADULTERY.

ADULTERESS, a woman guilty of ADULTERY. An adulteress, by our law, undergoes no temporal punishment whatever, except the loss of her dower; and she does not lose even that, if her husband is weak enough to be reconciled to her, and cohabit with her after the offence committed. 13 Ed. I. cap. 34.

But it is to be observed, that adulteresses are such either by the canon or civil law. According to the former, a woman is an adulteress who, either being herself married, converses carnally with another man; or being single herself, converses with a man that is married. According to the latter, she is not an adulteress, if she be not herself in the married state, though she converses with a man that is. The crime, in this case, was more properly called *stuprum* than *adulterium*. Hence, among the Romans, the word *adultera*, "adulteress," differed from *pellex*, which denoted a single woman who cohabited with a married man: and *pellex* differed from *concubina*, which signified her who had only intercourse with an unmarried man. The former was reputed infamous, and the latter innocent.

ADULTERATION, the act of debasing, by an improper mixture, something that was pure and genuine.

The word is Latin, formed of the verb *adulterare*, "to corrupt," by mingling something foreign to any substance. We have laws against the adulteration of coffee, tea, tobacco, snuff, wine, beer, bread, wax, hair-powder, &c.

ADULTERATION of coin, properly imports the making, or casting of a wrong metal, or with too base or too much alloy.

Adulterations of coins are effected divers ways; as, by forging another stamp or inscription; by mixing impure metals with the gold or silver: most properly, by making use of a wrong metal, or an undue alloy, or too great an admixture of the baser metals with gold or silver. Counterfeiting the stamp, or clipping and

Adversator
||
Adultera-
tion.

Adulterine, and lessening the weight, do not so properly come under **Adultery**. the denomination of *adulterating*.—Evelyn gives rules and methods, both of adulterating and detecting adulterated metals, &c.—*Adulterating* is somewhat less extensive than *debasing*, which includes diminishing, clipping, &c.

To adulterate or debase the current coin, is a capital crime in all nations.—The ancients punished it with great severity: among the Egyptians both hands were cut off; and by the civil law, the offender was thrown to wild beasts. The emperor Tacitus enacted, that counterfeiting the coin should be capital; and under Constantine it was made treason, as it is also among us. The adulterating of gems is a curious art, and the methods of detecting it no less useful. Nichols Lapid. p. 18.

ADULTERINE, in the civil law, is particularly applied to a child issued from an adulterous amour or commerce. Adulterine children are more odious than the illegitimate offspring of single persons.—The Roman law even refuses them the title of natural children; as if nature disowned them.—Adulterine children are not easily dispensed with for admission to orders. Those are not deemed adulterine, who are begotten of a woman openly married, through ignorance of a former wife being alive.—By a decree of the parliament of Paris, adulterine children are declared not legitimated by the subsequent marriage of the parties, even though a papal dispensation be had for such marriage, wherein is a clause of legitimation.

ADULTERINE Marriages, in St Augustine's sense, denote second marriages, contracted after a divorce.

ADULTERY, an unlawful commerce between one married person and another, or between a married and unmarried person.

Punishments have been annexed to adultery in most ages and nations, though of different degrees of severity. In many it has been capital; in others venial, and attended only with slight pecuniary mulcts. Some of the penalties are serious, and even cruel; others of a jocular and humorous kind. Even contrary things have been enacted as punishments for adultery. By some laws, the criminals are forbid marrying together, in case they became single; by others, they are forbid to marry any besides each other; by some, they are incapacitated from ever committing the like crime again; by others, they are glutted with it till it becomes downright nauseous.

Among the rich Greeks, adulterers were allowed to redeem themselves by a pecuniary fine; the woman's father, in such cases, returned the dower he had received from her husband, which some think was refunded by the adulterer. Another punishment among those people was, putting out the eyes of adulterers.

The Athenians had an extraordinary way of punishing adulterers, called *παράκλημα ἀραφανοιδωσις*, practised at least on the poorer sort who were not able to pay the fines. This was an awkward sort of empalement, performed by thrusting one of the largest radishes up the anus of the adulterer, or, in defect thereof, a fish with a large head, called *mugil*, "mullet." Alcæus is said to have died this way, though it is doubted whether the punishment was reputed mortal. Juvenal and Catullus speak of this custom as received also among the Romans, though not authorised by an express law, as it was among the Greeks.

VOL. I. Part I.

There are various conjectures concerning the ancient punishment of Adultery among the Romans. Some will have it to have been made capital by a law of Romulus, and again by the twelve tables. Others, that it was first made capital by Augustus; and others, not before the emperor Constantine. The truth is, the punishment in the early days was very various, much being left to the discretion of the husband and parents of the adulterous wife, who exercised it differently, rather with the silence and countenance of the magistrate than any formal authority from him. Thus we are told, the wife's father was allowed to kill both parties, when caught in the fact, provided he did it immediately, killed both together, and as it were with one blow. The same power ordinarily was not indulged the husband, except the crime were committed with some mean or infamous person; tho', in other cases, if his rage carried him to put them to death, he was not punished as a murderer. On many occasions, however, revenge was not carried so far; but mutilating, castrating, cutting off the ears, noses, &c. served the turn. The punishment allotted by the *lex Julia*, was not, as many have imagined, death; but rather banishment, or deportation, being interdicted fire and water: though Octavius appears, in several instances, to have gone beyond his own law, and to have put adulterers to death. Under Macrinus, many were burnt at a stake. Constantine first by law made the crime capital. Under Constantius and Constans, adulterers were burnt, or sewed in sacks and thrown into the sea. Under Leo and Marcian, the penalty was abated to perpetual banishment, or cutting off the nose. Under Justinian, a farther mitigation was granted, at least in favour of the wife, who was only to be scourged, lose her dower, and be shut up in a monastery: after two years, the husband was at liberty to take her back again; if he refused, she was shaven, and made a nun for life: But it still remained death in the husband. The reason alleged for this difference is, that the woman is the weaker vessel. Matthæus declaims against the empress Theodora, who is supposed to have been the cause of this law, as well as of others procured in favour of that sex from the emperor.

Under Theodosius, women convicted of this crime were punished after a very singular manner, viz. by a public constupration; being locked up in a narrow cell, and forced to admit to their embraces all the men that would offer themselves. To this end, the gallants were to dress themselves on purpose, having several little bells fastened to their clothes, the tinkling of which gave notice to those without of every motion. This custom was again abolished by the same prince.

By the Jewish law, adultery was punished by death in both parties, where they were both married, or only the woman. The Jews had a particular method of trying, or rather purging, an adulteress, or a woman suspected of the crime, by making her drink the bitter waters of jealousy; which, if she were guilty, made her swell.

Among the Mingrelians, according to Chardin, adultery is punished with the forfeiture of a hog, which is usually eaten in good friendship between the gallant, the adulteress, and the cuckold. In some parts of the Indies, it is said any man's wife is permitted to prostitute herself to him who will give an elephant for the use of her; and it is reputed no small glory to her to

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Adultery. have been rated so high. Adultery is said to be so frequent at Ceylon, that not a woman but practises it, notwithstanding its being punishable with death. Among the Japanese, and divers other nations, adultery is only penal in the woman. Among the Abyssinians, the crime of the husband is said to be only punished on the innocent wife. In the Marian islands, on the contrary, the woman is not punishable for adultery; but if the man go astray he pays severely: the wife and her relations waste his lands, turn him out of his house, &c. Among the Chinese, there is reason to conclude that adultery is not capital; for it is said that fond parents will make a contract for their daughters future husbands to allow them the indulgence of a gallant.

In Spain, they punished adultery in men by cutting off that part which had been the instrument of the crime. In Poland, before Christianity was established, they punished adultery and fornication in a very particular manner: the criminal they carried to the market-place, and there fastened him by the testicles with a nail; laying a razor within his reach, and leaving him under a necessity, either of doing justice upon himself or of perishing in that condition.

The Saxons formerly burnt the adulterers, and over her ashes erected a gibbet, whereon the adulterer was hanged. In this kingdom, likewise, adultery, by the ancient laws, was severely punished. King Edmund the Saxon ordered adultery to be punished in the same manner as homicide; and Canute the Dane ordered that a man who committed adultery should be banished, and that the woman should have her nose and ears cut off. In the time of Henry I. it was punished with the loss of eyes and genitals.

In Britain, adultery is reckoned a spiritual offence, that is, cognizable by the spiritual courts, where it is punished by fine and penance. The common law takes no farther notice of it, than to allow the party grieved an action and damages. This practice is often censured by foreigners, as making too light of a crime, the bad consequences of which, public as well as private, are so great. It has been answered, that perhaps this penalty, by civil action, is more wisely calculated to prevent the frequency of the offence, which ought to be the end of all laws, than a severer punishment. He that by a judgment of law is, according to circumstances, stripped of great part of his fortune, thrown into prison till he can pay it, or forced to fly his country, will no doubt, in most cases, own that he pays dearly for his amusement.

As to the moral turpitude of this offence, some have vainly endeavoured to deny or explain it away by various arguments, and even by an appeal to scripture. On the part of the *man* who solicits the chastity of a married woman, it certainly includes the crime of *seduction*, and is attended with mischief still more complicated and extensive: It creates a new sufferer, the injured husband, upon whose simplicity and affection is inflicted a wound the most painful and incurable that human nature knows. The infidelity of the *woman* is aggravated by cruelty to her children, who are generally involved in their parents shame, and always made unhappy by their quarrel.

It has been argued, that these consequences ought less to be attributed to the crime than to the discovery. But, in the first place, the crime could not be disco-

vered unless it were committed, and the commission is never secure from discovery. *2dly*, If adulterous connections were allowable whenever the parties could hope to escape detection, which is the conclusion to which this argument leads, the husband would be left no other security for his wife's chastity, than in her want of opportunity or temptation: which would probably deter most men from marrying; or render marriage a state of continual jealousy and alarm to the husband, which would end in the slavery and confinement of the wife.

The marriage-vow is "witnessed before God," and accompanied with circumstances of solemnity and religion which approach to the nature of an oath. The married offender, therefore, incurs a crime little short of perjury, and the seduction of a married woman is little less than subordination of perjury:—and this guilt is independent of the discovery.

But the usual apology for adultery is the prior transgression of the other party; and so far, indeed, as the bad effects of adultery are anticipated by the conduct of the husband or wife who offends first, the guilt of the second offender is extenuated. But this can never amount to a justification; unless it could be shown that the obligation of the marriage-vow depends upon the condition of reciprocal fidelity; a construction which appears founded neither in expediency, nor in the terms of the vow, nor in the design of the legislature which prescribed the marriage-rite. The way of considering the offence upon the footing of *provocation and retaliation*, is a childish trifling with words.

"Thou shalt not commit adultery," was an interdiction delivered by God himself; yet scripture has been adduced as giving countenance to the crime. As Christ told the woman taken in adultery, "Neither do I condemn thee," we must believe, it is said, that he deemed her conduct either not criminal, or at least not a crime of the heinous nature we represent it to be. But from a more attentive examination of the case, it will be evident that nothing can be concluded from it favourable to such an opinion. The transaction is thus related*: 'Early in the morning Jesus came again in-
' to the temple, and all the people came unto him;
' and he sat down and taught them; and the Scribes
' and Pharisees brought unto him a woman taken in
' adultery; and when they had set her in the midst,
' they said unto him, Master, this woman was taken
' in adultery, in the very act; now Moses in the law
' commanded that such should be stoned, but what
' sayest thou? This they said tempting him, that they
' might have to accuse him: but Jesus stooped down,
' and with his finger wrote on the ground, as though
' he heard them not. So when they continued asking
' him, he lift up himself, and said unto them, He that
' is without sin amongst you, let him first cast a
' stone at her; and again he stooped down and wrote
' on the ground: and they which heard it, being con-
' victed by their own conscience, went out one by one,
' beginning at the eldest, even unto the last; and Je-
' sus was left alone, and the woman standing in the
' midst. When Jesus had lift up himself, and saw none
' but the woman, he said unto her, Woman, where
' are those thine accusers? Hath no man condemned
' thee? She said unto him, No man, Lord: and he
' said unto her, *Neither do I condemn thee; go and sin*
' no more.'

* St John's
Gospel,
ch. viii.

* This

Adultery. 'This they said tempting him, that they might have to accuse him; that is, to draw him into an exercise of judicial authority, that they might have to accuse him before the Roman governor of usurping or intermeddling with the civil government.

Paley's
Moral and
Political
Philosophy,
p. 258. 3d.
edit. 4to.

"This was their design; and Christ's behaviour throughout the whole affair proceeded from a knowledge of this design, and a determination to defeat it. He gives them at first a cold and sullen reception, well suited to the insidious intention with which they came: 'he stooped down, and with his finger wrote on the ground as though he heard them not.' 'When they continued asking him,' when they teased him to speak, he dismissed them with a rebuke, which the impertinent malice of their errand, as well as the secret character of many of them, deserved: 'he that is without sin (that is, this sin) among you, let him first cast a stone at her.' This had its effect. Stung with the reproof, and disappointed of their aim, they stole away one by one, and left Jesus and the woman alone. And then follows the conversation, which is the part of the narrative most material to our present subject. 'Jesus saith unto her, Woman, where are those thine accusers? Hath no man condemned thee?' She said, No man, Lord. And Jesus said unto her, 'Neither do I condemn thee; go and sin no more.' Now, when Christ asked the woman, 'Hath no man condemned thee?' he certainly spoke, and was understood by the woman to speak, of a legal and judicial condemnation; otherwise her answer, 'No man, Lord,' was not true. In every other sense of condemnation, as blame, censure, reproof, private judgment, and the like, many had condemned her; all those, indeed, who brought her to Jesus. If then a judicial sentence was what Christ meant by *condemning* in the question, the common use of language requires us to suppose that he meant the same in his reply, 'Neither do I condemn thee: i. e. I pretend to no judicial character or authority over thee; it is no office or business of mine to pronounce to execute the sentence of the law. When Christ adds, 'Go and sin no more,' he in effect tells her that she had sinned already; but as to the degree or quality of the sin, or Christ's opinion concerning it, nothing is declared, or can be inferred, either way."

It has been controverted, whether adultery may be lawfully committed in war, with the enemies wives? The answer is in the negative, and the authorized practice of civilized nations is agreeable to this. It has also been a famous question, whether it be lawful for a woman to commit adultery with the consent of her husband, and for the procuring some great good to him? St Austin apparently allows of it; at least, does not condemn it*.

* De Serm. Dom. in Mont. lib. i. cap. 16. § 49. et De Civ. Dei, lib. xvi. cap. 25.

It has likewise been a dispute, whether it be lawful for one of the parties married to commit adultery, with the consent of the other, for the sake of having children? Of which we have instances in Abraham, who, on this account, conversed with Hagar; and likewise among the Greeks and Romans. Pollman, a German professor, has a dissertation on the husband's right to alienate his wife's body to another's use.

It is much disputed, whether adultery dissolves the bond of matrimony, and be a sufficient cause of divorce, so that the parties may marry again. This was

allowed in the ancient church, and is still continued in the Greek, as well as the Lutheran and Calvinist churches. Romanists, however, disallow of it, and the council of Trent even anathematized those who maintain it; though the canon of anathematization was mitigated in deference to the republic of Venice, in some of whose dominions, as Zant Cephalaria, &c. the contrary usage obtains. The ecclesiastical courts in England so far agree with the Papists, that they only grant a divorce *à mensa et thoro*, in case of adultery; so that a complete divorce, to enable the parties to marry again, cannot be had without an act of parliament.

ADULTERY is also used in ancient customs, for the punishment or fine imposed for that offence, or the privilege of prosecuting for it. In which sense, *adulterium* amounts to the same with what the Saxons call *legerwita*.

ADULTERY is sometimes used, in a more extensive sense, for any species of impurity or crime, against the virtue of chastity; and in this sense divines understand the seventh commandment.

ADULTERY is also used, especially in scripture, for idolatry, or departing from the true God, to the worship of a false one.

ADULTERY is also used, in ecclesiastical writers, for a person's invading or intruding into a bishopric during the former bishop's life. The reason of the appellation is, that a bishop is supposed to contract a kind of spiritual marriage with his church. The translation of a bishop from one see to another was also reputed a species of adultery; on the supposition of its being a kind of second marriage, which, in those days, was esteemed a degree of adultery. This conclusion was founded on that text of St Paul, *Let a bishop be the husband of one wife*, by a forced construction of church for wife, and of bishop for husband. Du-Cange.

ADULTERY is also used in ancient naturalists, for the act of ingrafting one plant upon another. In which sense, Pliny speaks of the adulteries of trees, *arborum adulteria*, which he represents as contrary to nature, and a piece of luxury, or needless refinement.

ADVOCATE, among the Romans, a person skilled in their law, who undertook the defence of causes at the bar. The Roman advocates answered to one part of the office of a barrister in England, viz. the pleading part; for they never gave counsel, that being the business of the *jurisconsulti*.

The Romans, in the first ages of their state, held the profession of an advocate in great honour; and the seats of their bar were crowded with senators and consuls; they, whose voices commanded the people, thinking it an honour to be employed in defending them. They were styled *comites*, *honorati*, *clarissimi*, and even *patroni*; as if their clients were not less obliged to them than freed men to their masters. The bar was not at that time venal. Those who aspired to honours and offices took this way of gaining an interest in the people, and always pleaded *gratis*. But no sooner were luxury and corruption introduced into the commonwealth, than the bar became a sharer in them. Then it was that the senators let out their voices for pay, and zeal and eloquence were sold to the highest bidder. To put a stop to this abuse, the

Adultery,
Advocate.

Advocates *tribune Cincius* procured a law to be passed, called from him *Lex Cincia*, whereby the advocates were forbid to take any money of their clients. It had before this been prohibited the advocates to take any presents or gratuities for their pleading. The emperor Augustus added a penalty to it: notwithstanding which, the advocates played their part so well, that the emperor Claudius thought it an extraordinary circumstance, when he obliged them not to take above eight great sesterces, which are equivalent to about L. 64 Sterling, for pleading each cause.

ADVOCATE is still used in countries and courts where the civil law obtains, for those who plead and defend the causes of clients trusted to them.

ADVOCATE of a city, in the German polity, a magistrate appointed in the emperor's name to administer justice.

ADVOCATE is more particularly used in church history, for a person appointed to defend the rights and revenues of a church or religious house. The word *advocatus*, or *advowee*, is still retained for what we usually call the *patron*, or he who has the advowson, or right of presentation in his own name.

Consistorial ADVOCATES; officers of the consistory at Rome, who plead in all oppositions to the disposal of benefices in that court: they are ten in number.

Elective ADVOCATES, those chosen by the abbot, bishop, or chapter; a particular licence being had from the king or prince for that purpose. The elections were originally made in the presence of the count of the province.

Feudal ADVOCATES. These were of the military kind, who, to make them more zealous for the interest of the church, had lands granted them in fee, which they held of the church, and did homage, and took an oath of fidelity to the bishop or abbot. These were to lead the vassals of the church to war, not only in private quarrels of the church itself, but in military expeditions for the king's service, in which they were the standard-bearers of their churches.

Fiscal ADVOCATE, *fisci advocatus*, in Roman antiquity, an officer of state under the Roman emperors, who pleaded in all causes wherein the *fiscus*, or private treasury, was concerned.

Juridical ADVOCATES, in the middle age, were those who from attending causes in the court of the comes, or count of the province, became judges themselves, and held courts of their vassals thrice a-year, under the name of the *tria placita generalia*. In consideration of this further service, they had a particular allowance of one third part of all fines, or mulcts, imposed on defaulters, &c. besides a proportion of diet for themselves and servants.

Matricular ADVOCATES, were the advocates of the mother or cathedral churches.

Military ADVOCATES, those appointed for the defence of the church, rather by arms and authority than by pleading and eloquence. These were introduced in the times of confusion, when every person was obliged to maintain their own property by force; bishops and abbots not being permitted to bear arms, and the scholastic or gowned advocates being equally unacquainted with them, recourse was had to knights, noblemen, soldiers, or even to princes.

Nominative ADVOCATES, those appointed by a king

or pope. Sometimes the churches petitioned kings, &c. to appoint them an advocate; at other times this was done of their own accord. By some regulations, no person was capable of being elected advocate, unless he had an estate in land in the same county.

Regular ADVOCATES, those duly formed and qualified for their profession, by a proper course of study, the requisite oath, subscription, licence, &c.

Subordinate ADVOCATES, those appointed by other superior ones, acting under them, and accountable to them. There were various reasons for the creation of these subordinate advocates; as, the superior quality of the principal advocate, his being detained in war, or being involved in other affairs; but chiefly the too great distance of some of the church-lands, and their lying in the dominions of foreign princes.

Supreme or Sovereign ADVOCATES, were those who had the authority in chief; but acted by deputies or subordinate advocates. These were called also *principal*, *greater*, and sometimes *general* advocates. Such in many cases were kings, &c. when either they had been chosen advocates, or became such by being founders or endowers of churches. Princes had also another title to advocateship, some of them pretending to be *advocati nati* of the churches within their dominions.

ADVOCATES, in the English courts, are more generally called *counsel*. See **COUNSEL**.

Faculty of ADVOCATES, in Scotland, a respectable body of lawyers, who plead in all causes before the Courts of Session, Justiciary, and Exchequer. They are also intitled to plead in the house of peers, and other supreme courts in England.

In the year 1660, the faculty founded a library upon a very extensive plan, suggested by that learned and eminent lawyer Sir George M'Kenzie of Rosehaugh, advocate to king Charles II. and king James VII. who enriched it with many valuable books. It has been daily increasing since that time, and now contains not only the best collection of law-books in Europe, but a very large and select collection of books on all subjects. Besides, this library contains a great number of original manuscripts, and a vast variety of Jewish, Grecian, Roman, Scots, and English coins and medals.

A candidate for the office of an advocate undergoes three several trials: The first is in Latin, upon the civil law and Greek and Roman antiquities; the second, in English, upon the municipal law of Scotland; and, in the third, he is obliged to defend a Latin thesis, which is impugned by three members of the faculty. Immediately before putting on the gown, the candidate makes a short Latin speech to the lords, and then takes the oaths to the government and *de fide*.

The faculty at present consists of above 200 members. As an advocate or lawyer is esteemed the gentlest profession in Scotland, many gentlemen of fortune take the degree of advocate, without having any intention of practising at the bar. This circumstance greatly increases their number, gives dignity to the profession, and enriches their library and public fund. It is from this respectable body that all vacancies on the bench are generally supplied.

Lord ADVOCATE, or *King's Advocate*, one of the eight great officers of state in Scotland, who as such

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Advocation sat in parliament without election. He is the principal crown-lawyer in Scotland. His business is to act as a public prosecutor, and to plead in all causes that concern the crown; but particularly in such as are of a criminal nature. The office of king's advocate is not very ancient; It seems to have been established about the beginning of the 16th century. Originally he had no power to prosecute crimes without the concurrence of a private party; but, in the year 1597, he was empowered to prosecute crimes at his own instance. He has the privilege of pleading in court with his hat on. This privilege was first granted to Sir Thomas Hope; who having three sons lords of session, it was thought indecent that the father should plead uncovered before the sons, who as judges sat covered.

BILL OF ADVOCATION, in Scots law, a writing drawn up in the form of a petition; whereby a party, in an action before an inferior court, applies to the supreme court, or court of session, for calling the action from the inferior court before itself.

Letters of ADVOCATION, in Scots law, the decree or warrant of the court of session upon cognisance of the facts set forth in the bill, drawn up in the form of a summons, and passing under the signet, discharging the inferior judge and all others from further procedure in the cause, and advocating it to itself.

ADVOWEE, in ancient customs and law books, denotes the advocate of a church, religious house, or the like. There were advowees of cathedrals, abbeys, monasteries, &c. Thus, Charlemagne had the title of advowee of St Peter's; king Hugh, of St Riquier; and Bolandus mentions some letters of pope Nicholas, by which he constituted king Edward the Confessor, and his successors, advowees of the monastery at Westminster; and of all the churches in England. These advowees were the guardians, protectors, and administrators of the temporal concerns of the churches, &c. and under their authority were passed all contracts which related to them. It appears also, from the most ancient charters, that the donations made to churches were conferred on the persons of the advowees. They always pleaded the causes of the churches in court, and distributed justice for them, in the places under their jurisdiction. They also commanded the forces furnished by their monasteries, &c. for the war; and even were their champions, and sometimes maintained duels for them.

This office is said to have been first introduced in the fourth century, in the time of Stilico; though the Benedictines do not fix its origin before the eighth century. By degrees, men of the first rank were brought into it, as it was found necessary either to defend with arms or to protect with power and authority. In some monasteries they were only called *conservators*; but these, without the name, had all the functions of advowees. There were also sometimes several sub-advowees, or sub-advocates, in each monastery, who officiated instead of the advowees themselves; which, however, proved the ruin of monasteries; those inferior officers running into great abuses.

Hence also, husbands, tutors, and every person in general, who took upon him the defence of another, were denominated *advowees*, or advocates. Hence several cities had their advowees; which were established long after the ecclesiastical ones, and doubtless from

their example. Thus we read in history of the advowees of Augsburg, of Arras, &c.

The *vidames* assumed the quality of advowees; and hence it is, that several historians of the eighth century confound the two functions together. Hence also it is, that several secular lords in Germany bear mitres for their crests, as having anciently been advowees of the great churches.

Spelman distinguishes two kinds of ecclesiastical advowees.—The one, of causes or processs, *advocatus causarum*; the other, of territory or lands, *advocatus soli*. The former were nominated by the king, and were usually lawyers, who undertook to plead the causes of the monasteries. The other, which still subsist, and are sometimes called by their primitive name, *advowees*, though more usually *patrons*, were hereditary; as being the founders and endowers of churches, &c. or their heirs.

Women were sometimes advowees, *advocatissæ*. And, in effect, the canon law mentions some who had this title, and who had the same right of presentation, &c. in their churches which the advowees themselves had. In a stat. 25 Edw. III. we meet with *advowee paramount* for the highest patron; that is, the king.

ADVOWSON, or **ADVOWZEN**, in common law, signifies a right to present to a vacant benefice. Advowson is so called, because the right of presenting to the church was first gained by such as were founders, benefactors, or maintainers of the church.

Though the nomination of fit persons to officiate in every diocese was originally in the bishop, yet they were content to let the founders of churches have the nomination of the persons to the churches so founded, reserving to themselves a right to judge of the fitness of the persons so nominated.

Advowsons formerly were most of them appendant to manors, and the patrons were parochial barons; the lordship of the manor and patronage of the church were seldom in different hands, until advowsons were given to religious houses. But of late times the lordship of the manor and advowson of the church have been divided.

Advowsons are *presentative*, *collative*, or *donative*: *presentative*, where the patron presents or offers his clerk to the bishop of the diocese, to be instituted in his church; *collative*, where the benefice is given by the bishop, as original patron thereof, or by means of a right he has acquired by lapse; *donative*, as where the king or other patron does, by a single donation in writing, put the clerk into possession, without presentation, institution, or induction.

Sometimes, anciently, the patron had the sole nomination of the prelate, abbot, or prior; either by investiture (*i. e.* delivery of a pastoral staff), or by direct presentation to the diocesan; and if a free election was left to the religious, yet a *conge d'elire*, or licence of election, was first to be obtained of the patron, and the person elected was confirmed by him. If the founder's family became extinct, the patronage of the convent went to the lord of the manor. Unless the several colleges in the universities be restrained in the number of advowsons they may receive, it is argued they will in time acquire such a stock as to frustrate the design of their foundation (which is the education of youth), by creating too quick a succession of fellows;

Advowee,
Advowson.

Adust
||
Adze.

lows; so that there will not be in the colleges a sufficient number of persons of competent age, knowledge, and experience, to instruct and form the minds of the youth.—In some colleges the number of advowsons is said to be already two thirds, or more, of the number of fellows.—It is objected, on the other side, that the succession of fellows may be too slow as well as too quick; whereby persons well qualified may be detained so long in colleges as not to have strength or activity enough left for the discharge of parochial functions.

Colleges holding more advowsons in number than a moiety of the fellows, are not capable of purchasing more. Grants of advowsons by Papists are void. 9 Geo. II. c. 36. § 5. 11 Geo. II. c. 17. § 5.

Advowsons are temporal inheritances and lay fees; they may be granted by deed or will, and are assets in the hands of heirs or executors. Presentations to advowsons for money, or other reward, are void. 31 Eliz. cap. 6.

In Scotland, this right is called *patronage*. See PATRONAGE.

ADUST, ADUSTUS, among physicians, &c. is applied to such humours as by long heat become of a hot and fiery nature. Such is choler supposed to be. Melancholy is usually considered as black and adust bile. Blood is said to be adust, when, by reason of some extraordinary heat, its more subtile parts are all evaporated, leaving the grosser, with all the impurities therein, half torried.

ADY, in natural history, a name given to the palm-tree of the island of St Thomas. It is a tall tree, with a thick, bare, upright stem, growing single on its root, of a thin light timber, and full of juice. The head of this tree shoots into a vast number of branches, which being cut off, or an incision being made therein, afford a great quantity of sweet juice, which fermenting supplies the place of wine among the Indians. The fruit of this tree is called by the Portuguese *Caryoces* and *Carioffe*; and by the black natives, *Abanga*. This fruit is of the size and shape of a lemon; and contains a kernel, which is good to eat. The fruit itself is eat roasted, and the raw kernels are often mixed with mandioc meal. These kernels are supposed very cordial. An oil is also prepared from this fruit, which answers the purpose of oil or butter. This oil is also used for anointing stiff and contracted parts of the body.

ADYNAMIA, in medicine, debility, or weakness, from sickness.

ADYNAMON, among ancient physicians, a kind of weak factitious wine, prepared from malt boiled down with water; to be given to patients to whom genuine wine might be hurtful.

ADYTUM, in pagan antiquity, the most retired and sacred place of their temples, into which none but the priests were allowed to enter. The *Sanctum Sanctorum* of the temple of Solomon was of the nature of the pagan adytum, none but the high priest being admitted into it, and he but once a-year.

ADZE, or ADDICE, a cutting tool of the ax kind; having its blade made thin and arching, and its edge at right angles to the handle; chiefly used for taking off thin chips of timber or boards, and for paring away certain irregularities which the ax cannot come at. The adze is used by carpenters, but more by coopers, as being convenient for cutting the hollow sides of

boards, &c. It is ground from a base on its inside to its outer edge; so that, when it is blunt, they cannot conveniently grind it without taking its helve out of the eye.

ÆE, or Æ, a diphthong compounded of A and E. Authors are by no means agreed as to the use of the *æ* in English words.—Some, out of regard to etymology, insist on its being retained in all words, particularly technical ones, borrowed from the Greek and Latin; while others, from a consideration that it is no proper diphthong in our language, its sound being no other than that of the simple *e*, contend that it ought to be entirely disused; and, in fact, the simple *e* has of late been adopted instead of the Roman *æ*, as in the word *equator*, &c.

ÆACEA, in Grecian antiquity, solemn festivals and games celebrated at Ægina, in honour of Æacus.

ÆACUS, the son of Jupiter by Ægina. When the isle of Ægina was depopulated by a plague, his father, in compassion to his grief, changed all the ants upon it into men and women, who were called *Myrmidons*, from *μυρμηκς*, an ant. The foundation of the fable is said to be, that when the country had been depopulated by pirates, who forced the few that remained to take shelter in caves, Æacus encouraged them to come out, and by commerce and industry recover what they had lost. His character for justice was such, that, in a time of universal drought, he was nominated by the Delphic oracle to intercede for Greece, and his prayer was answered. See the article ÆGINA. The Pagans also imagined that Æacus, on account of his impartial justice, was chosen by Pluto one of the three judges of the dead: and that it was his province to judge the Europeans.

ÆBURA (anc. geog.), a town of Spain, in Estremadura, on the river Guadiana, to the west of Merida, now called *Talavera*. W. Long. 7. 15. Lat. 38. 40.

ÆCHMALOTARCHA, in Jewish antiquity, a title given to the principal leader or governor of the Hebrew captives residing in Chaldea, Assyria, and the neighbouring countries. This magistrate was called by the Jews *rosch-galath*, i. e. the chief of the captivity: but the above term, of like import in the Greek, is that used by Origen and others who wrote in the Greek tongue.

The Jewish writers assure us, that the *æchmalotarchæ* were only to be chosen out of the tribe of Judah. The eastern Jews had their princes of the captivity, as the western Jews their patriarchs. The Jews are still said to have an *æchmalotarcha* at Babylon, but without the authority of the ancient ones. Basnage Hist. Jews, and Prideaux's Connection.

ÆCULANUM (anc. geog.), a town of the Hirpini in Italy, at the foot of the Appennin, to the east of Abellinum, contracted *Æclanum*, situate between Beneventum and Tarentum. The inhabitants are called *Æculani* by Pliny; and *Æclanenses*, in an ancient inscription (Gruter). The town is now called *Fricento*, Cluverius, 43 miles east of Naples. E. Long. 15. 38. Lat. 41. 15.

ÆDES, in Roman antiquity, besides its more ordinary signification of a house, likewise signified an inferior kind of temple, consecrated to some deity.

ÆDICULA, a term used to denote the inner part of

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Ædicula.

Ædilate, of the temple, where the altar and statue of the deity stood.
Ædile.

ÆDILATE, the office of *ædile*, sometimes called *Ædilitia*. See the next article.

ÆDILE (*ædilis*), in Roman antiquity, a magistrate whose chief business was to superintend buildings of all kinds, but more especially public ones, as temples, aqueducts, bridges, &c. To the *ædiles* likewise belonged the care of the highways, public places, weights and measures, &c. They also fixed the prices of provisions, took cognizance of debauches, punished lewd women, and such persons as frequented gaming houses. The custody of the *plebiscita*, or orders of the people, was likewise committed to them. They had the inspection of comedies and other pieces of wit; and were obliged to exhibit magnificent games to the people, at their own expence, whereby many of them were ruined. To them also belonged the custody of the *plebiscita*, and the censure and examination of books. They had the power, on certain occasions, of issuing edicts; and, by degrees, they procured to themselves a considerable jurisdiction, the cognizance of various causes, &c. This office ruined numbers by its expensiveness; so that, in Augustus's time, even many senators declined it on that account.

All these functions which rendered the *ædiles* so considerable belonged at first to the *ædiles* of the people, *ædiles plebeii*, or *minores*: these were only two in number, and were first created in the same year as the tribunes: for the tribunes, finding themselves oppressed with the multiplicity of affairs, demanded of the senate to have officers, with whom they might intrust matters of less importance: and accordingly two *ædiles* were created; and hence it was that the *ædiles* were elected every year at the same assembly as the tribunes. But these plebeian *ædiles* having refused, on a signal occasion, to treat the people with shows, as pleading themselves unable to support the expence thereof, the patricians made an offer to do it, provided they would admit them to the honours of the *ædilate*. On this occasion there were two new *ædiles* created, of the number of the patricians, in the year of Rome 388; they were called *ædiles curules*, or *maiores*; as having a right to sit on a curule chair, enriched with ivory, when they gave audience; whereas the plebeian *ædiles* only sat on benches.—Besides that the curule *ædiles* shared all the ordinary functions with the plebeian, their chief employ was, to procure the celebration of the grand Roman games, and to exhibit comedies, shews of gladiators, &c. to the people; and they were also appointed judges in all cases relating to the selling or exchanging estates.

To ease these four first *ædiles*, Cæsar created a new kind, called *ædiles cereales*, as being deputed chiefly to take care of the corn, which was called *donum cereris*; for the Heathens honoured Ceres as the goddess who presided over corn, and attributed to her the invention of agriculture. These *ædiles cereales* were also taken out of the order of patricians. In the municipal cities there were *ædiles*, and with the same authority as at Rome.

We also read of an *ædiles alimentarius*, expressed in abbreviation by *Ædil. alim.* whose business seems to have been to provide diet for those who were maintained at the public charge, though others assign him a

different office.—In an ancient inscription we also meet with *ædile* of the camp, *ædilis castrorum*.

ÆDILITIUM *edictum*, among the Romans, was that whereby a remedy was given a buyer, in case a vicious or unsound beast, or slave, was sold him. It was called *ædilitium*, because the preventing of frauds in sales and contracts belonged especially to the curule *ædiles*.

ÆDITUUS, in Roman antiquity, an officer belonging to the temple, who had the charge of the offerings, treasure, and sacred utensils. The female deities had a woman officer of this kind called *Æditua*.

ÆGAGROPILA, a ball composed of a substance resembling hair, generated in the stomach of the chamois-goat. This ball is of the same nature with those found in cows, hogs, &c.

ÆGÆ, or **ÆGÆA** (anc. geog.), the name of *Ædesa*, so called from the following adventure: Caranus, the first king of Macedonia, being ordered by the oracle to seek out a settlement in Macedonia, under the conduct of a flock of goats, surprised the town of *Ædesa*, during a thick fog and rainy weather, in following the goats that fled from the rain; which goats ever after, in all his military expeditions, he caused to precede his standard; and in memory of this he called *Ædesa* *Ægæa*, and his people *Ægææ*. And hence probably, in the prophet Daniel, the he-goat is the symbol of the king of Macedon.

ÆGEAN SEA (anc. geog.) now the *Archipelago*, a part of the Mediterranean, separating Europe from Asia and Africa; washing, on the one hand, Greece and Macedonia; on the other, Caria and Ionia. The origin of the name is greatly disputed. Festus advances three opinions: one, that it is so called from the many islands therein, at a distance appearing like so many goats: another, because *Ægea* queen of the Amazons perished in it: a third opinion is, because *Ægeus*, the father of Theseus, threw himself headlong into it.

ÆGEUS, in fabulous history, was king of Athens, and the father of Theseus. The Athenians having basely killed the son of Minos king of Crete, for carrying away the prize from them, Minos made war upon the Athenians; and being victorious, imposed this severe condition on *Ægeus*, that he should annually send into Crete seven of the noblest of the Athenian youths, chosen by lot, to be devoured by the Minotaur. On the fourth year of this tribute, the choice fell on Theseus; or, as others say, he himself intreated to be sent. The king, at his son's departure, gave orders, that as the ship sailed with black sails, it should return with the same in case he perished; but, if he became victorious, he should change them into white. When Theseus returned to Crete, after killing the Minotaur, and forgot to change the sails in token of his victory, according to the agreement with his father; the latter, who watched the return of the vessel, supposing by the black sails that his son was dead, cast himself headlong into the sea, which afterwards obtained the name of the *Ægean Sea*. The Athenians decreed *Ægeus* divine honours; and sacrificed to him as a marine deity, the adopted son of Neptune.

ÆGIAS, among physicians, a white speck on the pupil of the eye, which occasions a dimness of sight.

ÆGIDA, (Pliny); now *Capo d' Isiria* the principal

Ædilitium
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Ægida.

Ægilops pal town on the north of the territory of Istria, situated in a little island, joined to the land by a bridge. In an inscription, (Gruter); it is called *Ægidis Insula*. E. Long. 14. 20. Lat. 45. 50. It was afterwards called *Justinopolis*, after the emperor Justinus.

ÆGILOPS, the name of a tumor in the great angle of the eye; either with, or without, an inflammation. The word is compounded of *αἴς*, goat, and *ὤψ*, eye; as goats are supposed extremely liable to this distemper.

Authors frequently use the words *ægilops*, *anchilops*, and *fistula lachrymalis*, promiscuously; but the more accurate, after *Ægineta*, make a difference.—The tumor, before it becomes ulcerous, is properly called *anchilops*; and, after it is got into the lachrymal passages, and has rendered the os lachrymale carious, *fistula lachrymalis*.

If the *ægilops* be accompanied with an inflammation, it is supposed to take its rise from the abundance of blood which a plethoric habit discharges on the corner of the eye. If it be without an inflammation, it is supposed to proceed from a viscous pituitous humour, thrown upon this part.

The method of cure is the same as that of the ophthalmia. But before it has reached the lachrymal passages, it is managed like other ulcers. If the *ægilops* be neglected, it bursts, and degenerates into a fistula, which eats into the bone.

ÆGILOPS, *Wild Fescue*; a genus of the monœcia order, belonging to the polygamia class of plants, and ranking under the 4th natural order, *Gramina*.—The characters are: The *hermaphrodite calyx* is a two-valved glume, triflorous; the corolla a two-valved glume, the exterior valvalet terminated by three aristæ or awns, the interior awnless: *Stamina*, three capillary filaments; style, two: *Seed*, one, oblong. *Male calyx* and *Corolla*, each a glume as in the former; and *stamina*, the same number.—There are seven species, natives of Italy and some other parts of Europe; one of them, the *incurvata*, a native of Britain, grows by the sea-shore, and is vulgarly called *sea-hard-grass*.

ÆGILOPS is also the trivial name of a species of *QUERCUS*.

ÆGIMURUS (anc. geog.), an island on the bay of Carthage, about 30 miles distant from that city, (Livy); now the *Galetta*: This island being afterwards sunk in the sea, two of its rocks remained above water, which were called *Aræ*, and mentioned by Virgil, because the Romans and Carthaginians entered into an agreement or league to settle their mutual boundaries at these rocks.

ÆGINA, in fabulous history, the daughter of *Æopos*, king of Bæotia, was beloved by Jupiter, who debauched her in the similitude of a lambent flame, and then carried her from Epidaurus to a desert island called *Oenope*, which afterwards obtained her own name.

ÆGINA (anc. geog.), an island on the Saronic Bay, or Bay of Engia, 20 miles distant from the Piræus, formerly vying with Athens for naval power, and at the sea-fight of Salamis disputing the palm of victory with the Athenians. It was the country and kingdom of *Æacus*, who called it *Ægina* from his mother's name, it being before called *Oenopia*, (Ovid). The inhabitants were called *Æginetæ*, and *Æginenses*. The Greeks

No 4.

had a common temple dedicated to Jupiter in *Ægina*. The *Æginetæ* applied to commerce; and were the first who coined money, called *Νομισμα Ἀγιναιον*: hence *Ægineticum æs*, formerly in great repute. The inhabitants were called *Myrmidones*, or a nation of ants, from their great application to agriculture. See *ÆACUS*.

This island was surrounded by Attica, the territory of Megara, and the Peloponnesus, each distant about 100 stadia, or 12 miles and a half. In circumference it was reckoned 180 stadia, or 22 miles and a half. It was washed on the east and south by the Myrtoan and Cretan seas.

It is now called *Egina*, or *Egina*, the *g* soft and the *i* short. The temple above-mentioned is situated upon the summit of a mountain called *Panhellenius*, about an hour distant from the shore. The *Æginetans* affirmed it was erected by *Æacus*; in whose time Hellas being terribly oppressed by drought, the Delphic oracle was consulted; and the response was, That Jupiter must be rendered propitious by *Æacus*. The cities intreated him to be their mediator: He sacrificed and prayed to Jupiter *Panhellenius*, and procured rain.

The temple was of the Doric order, and had six columns in front. Twenty-one of the exterior columns are yet standing, with two in the front of the pronaos and of the posticum, and five of the number which formed the ranges of the cell. The entablature, except the architrave, is fallen. The stone is of a light brownish colour, much eaten in many places, and indicating a very great age. Some of the columns have been injured by boring to their centres for the metal. In several, the junction of the parts is so exact, that each seems to consist of one piece. This ruin Mr Chandler considers as scarcely to be paralleled in its claim to a remote antiquity. The situation on a lonely mountain, at a distance from the sea, has preserved it from total demolition, amid all the changes and accidents of numerous centuries.

Near the shore is a barrow, raised, it is related, for Phocus, upon the following occasion. Telamon and Peleus, sons of *Æacus*, challenged their half brother Phocus to contend in the Pentathlon. In throwing the stone, which served as a quoit, Peleus hit Phocus, who was killed; when both of them fled. Afterwards, Telamon sent a herald to assert his innocence. *Æacus* would not suffer him to land, or to apologize, except from the vessel; or, if he chose rather, from a heap cast up in the water. Telamon, entering the private port by night, raised a barrow, as a token, it is likely, of a pious regard for the deceased. He was afterwards condemned, as not free from guilt; and sailed away again to Salamis. The barrow in the second century, when seen by Pausanias, was surrounded with a fence, and had on it a rough stone. The terror of some dreadful judgment to be inflicted from heaven had preserved it entire and unaltered to his time; and in a country depopulated and neglected, it may still endure for many ages.

The soil of this island is, as described by Strabo, very stony, especially the bottoms, but in some places not unfertile in grain. Besides corn, it produces olives, grapes, and almonds; and abounds in pigeons and partridges. It has been related, that the *Æginetans* annually wage war with the feathered race, carefully

Ægina.

^{Ægina}
^{Æginhard.} fully collecting or breaking their eggs, to prevent their multiplying, and in consequence a yearly famine. They have no hares, foxes, or wolves. The rivers in summer are all dry. The vaiwode or governor farms the revenue of the Grand Signior for 12 purses, or 6000 piastres. About half this sum is repaid yearly by the caratch-money, or poll-tax.

ÆGINA, the capital of the above island. Its site has been long forsaken. Instead of the temples mentioned by Pausanias, there are 13 lonely churches, all very mean; and two Doric columns supporting their architrave. These stand by the sea-side toward the low cape; and, it has been supposed, are a remnant of a temple of Venus, which was situated by the port principally frequented. The theatre, which is recorded as worth seeing, resembled that of the Epidaurians both in size and workmanship. It was not far from the private port; the stadium, which, like that at Priene, was constructed with only one side, being joined to it behind, and each structure mutually sustaining and propping the other. The walls belonging to the ports and arsenal were of excellent masonry, and may be traced to a considerable extent, above, or nearly even with, the water. At the entrance of the mole, on the left, is a small chapel of St Nicholas; and opposite, a square tower with steps before it, detached, from which a bridge was laid across, to be removed on any alarm. This structure, which is mean, was erected by the Venetians, while at war with the Turks in 1693.

ÆGINETA (Paulus), a celebrated surgeon of the island of Ægina, from whence he derived his name. According to Mr Le Clerc's calculation, he lived in the fourth century; but Abulpharagius the Arabian, who is allowed to give the best account of those times, places him with more probability in the seventh. His knowledge in surgery was very great, and his works are deservedly famous. Fabricius ab Aquapendente has thought fit to transcribe him in a great variety of places. Indeed the doctrine of Paulus Ægineta, together with that of Celsus and Albucasis, make up the whole text of this author. He is the first writer who takes notice of the cathartic quality of rhubarb; and, according to Dr Milward, is the first in all antiquity who deserves the title of a man-midwife.

ÆGINHARD, the celebrated secretary and supposed son-in-law of Charlemagne. He is said to have been carried through the snow on the shoulders of the affectionate and ingenious Imma, to prevent his being tracked from her apartments by the emperor her father: a story which the elegant pen of Addison has copied and embellished from an old German chronicle, and inserted in the 3d volume of the Spectator.—This happy lover (supposing the story to be true) seems to have possessed a heart not unworthy of so enchanting a mistress, and to have returned her affection with the most faithful attachment; for there is a letter of Æginhard's still extant, lamenting the death of his wife, which is written in the tenderest strain of connubial affliction;—it does not, however, express that this lady was the affectionate princess; and indeed some late critics have proved that Imma was not the daughter of Charlemagne.—But to return to our historian: He was a native of Germany, and educated by the munificence of his imperial master, of which he has left the most grateful testimony in his preface to the life of that monarch.

VOL. I. PART I.

Æginhard, after the loss of his lamented wife, is supposed to have passed the remainder of his days in religious retirement, and to have died soon after the year 840. His life of Charlemagne, his annals from 741 to 889, and his letters, are all inserted in the 2d volume of Duchesne's *Scriptores Francorum*. But there is an improved edition of this valuable historian, with the annotations of Hermann Schmincke, in 4to, 1711.

ÆGIPAN, in heathen mythology, a denomination given to the god Pan, because he was represented with the horns, legs, feet, &c. of a goat.

ÆGIPHILA, GOAT-FRIEND: a genus of the monogynia order, belonging to the tetrandia class of plants; the characters of which are: The *calyx* is a single-leaved perianthium, bell-shap'd, four-tooth'd, loose, very short, and persistent: The *corolla* consists of one petal; the *tubus* cylindric, narrower and longer than the *calyx*; the border divided into four segments, flat and equal; the divisions oblong: The *stamina* consist of four erect capillary filaments; the antheræ are incumbent and squared: The *pistillum* has a germen above; a capillary, two-clift, middle-sized stylus; and a simple stigma: The *pericarpium* is a roundish unilocular berry: The *seeds* are four. There is only one species, a native of Martinico.

ÆGIS, in the ancient mythology, a name given to the shield or buckler of Jupiter and Pallas.

The goat Amalthea, which had suckled Jove, being dead, that god is said to have covered his buckler with the skin thereof; whence the appellation *ægis*, from *αἴς, αἴγος, she-goat*. Jupiter, afterwards restoring the beast to life again, covered it with a new skin, and placed it among the stars. As to his buckler, he made a present of it to Minerva: whence that goddess's buckler is also called *ægis*.

Minerva, having killed the Gorgon Medusa, nailed her head in the middle of the *ægis*, which henceforth had the faculty of converting into stone all those who looked thereon; as Medusa herself had done during her life.

Others take the *ægis* not to have been a buckler, but a cuirass, or breast-plate: and it is certain the *ægis* of Pallas, described by Virgil, *Æn. lib. viii. ver. 435*, must have been a cuirass; since that poet says expressly, that Medusa's head was on the breast of the goddess. But the *ægis* of Jupiter, mentioned a little higher, *ver. 354*, seems to have been a buckler: the words

Cum saepe nigrantem

Ægida concuteret dextra,

agreeing very well to a buckler; but not at all to a cuirass or breast-plate.

Servius makes the same distinction on the two passages of Virgil: for on verse 354, he takes the *ægis* for the buckler of Jupiter, made, as above-mentioned, of the skin of the goat Amalthea; and on verse 435, he describes the *ægis* as the armour which covers the breast, and which in speaking of men is called *cuirass*, and *ægis* in speaking of the gods. Many authors have overlooked these distinctions for want of going to the sources.

ÆGISTHUS, in ancient history, was the son of Thyestes by his own daughter Pilopeia, who, to conceal her shame, exposed him in the woods; some say he was taken up by a shepherd, and suckled by a goat, whence he was called *Ægesthus*. He corrupted Cly-

S

temnestra

Ægipan
Ægisthus.

Ægithallus ^{||} *Ægospotamos.* *temnestra* the wife of Agamemnon; and with her assistance slew her husband, and reigned seven years in Mycenæ. He was, together with Clytemnestra, slain by Orestes. Pompey used to call Julius Cæsar *Ægisthus*, on account of his having corrupted his wife Mutia, whom he afterwards put away, though he had three children by her.

ÆGITHALLUS (anc. geog.), a promontory and citadel of Sicily, between Drepanum and the Emporium Aegisthanum, afterwards called *Acellus*; corruptly written *Ægitharfos*, in Ptolemy; situate near mount Eryx, and now called *Capo di Santo Teodoro*.

ÆGIUM, (anc. geog.) a town of Achaia Propria, five miles from the place where Helice stood, and famous for the council of the Achæans, which usually met there on account either of the dignity or commodious situation of the place. It was also famous for the worship of *Θαυρυγίος Διός*, *Conventional Jupiter*, and of *Panachæan Ceres*. The territory of Ægium was watered by two rivers, viz. the Phoenix and Meganitas. The epithet is *Ægiensis*. There is a coin in the cabinet of the king of Prussia, with the inscription *ΑΙΓΙ*, and the figure of a tortoise, which is the symbol of Peloponnesus, and leaves no doubt as to the place where it was struck.

ÆGOBOLIUM, in antiquity, the sacrifice of a goat offered to Cybele. The ægobolium was an expiatory sacrifice, which bore a near resemblance to the taurobolium and criobolium, and seems to have been sometimes joined with them.

ÆGOPODIUM, SMALL WILD ANGELICA, GOUT-WORT, GOATSFOOT, HERB GERARD, or ASHWEED; a genus of the digynia order, belonging to the pentandria class of plants; the characters of which are: The universal *calyx* is a manifold convex umble; the partial one, coniform and flat; there is no involucre; and the proper perianthium is scarcely discernible: The universal *corolla* is uniform, the florets all fertile; the proper one has five inverse-ovate, concave, equal petals, inflexed at the top: The *stamina* consist of five simple filaments twice the length of the corolla; the antheræ roundish: The *pistillum* has a germen beneath; two purple erect style the length of the corolla; the stigmata are headed: No *pericarpium*: The fruit is ovate, striated, and bipartite: The *seeds* are two, ovate, on one side convex and striated, and flat on the other. There is but one species, a native of Britain and other parts of Europe. It is very common under hedges and about gardens; the leaves resemble those of Angelica, and it carries small white flowers. Its roots run so fast, as to render it a very troublesome weed.

ÆGOPRICON; a genus of the monœcia order, belonging to the diandria class of plants; the characters of which are: The *calyx* both of the male and female is a tubular perianthium of one leaf divided into three segments: *Corolla* wanting in both: The *stamina* consist of a single erect filament longer than the calyx, with an ovate anthera: The *pistillum* has an ovate germen, three divaricated styli, and simple persistent stigmata: The *pericarpium* is a globular berry, three-grained within, and three-cell'd: The *seeds* are solitary, and angular on one side.—There is but one species, a native of Surinam.

ÆGOSPOTAMOS, (anc. geog.), a river in the Thracian Chersonesus, falling with a south-east course

into the Hellespont, to the north of Sestos; also a *Ægospotamos* town, station, or road for ships at its mouth. Here the Athenians, under Conon, through the fault of his colleague Isocrates, received a signal overthrow from the Lacedæmonians under Lysander, which was followed by the taking of Athens, and put an end to the Peloponnesian war. The Athenian fleet having followed the Lacedæmonians, anchored in the road, over against the enemy, who lay before Lampacus. The Hellespont is not above two thousand paces broad in that place. The two armies seeing themselves so near each other, expected only to rest that day, and were in hopes of coming to a battle on the next.

But Lysander had another design in his view. He commanded the seamen and pilots to go on board their galleys, as if they were in reality to fight the next morning at break of day, to hold themselves in readiness, and to wait his orders with profound silence. He commanded the land-army in like manner to draw up in battle upon the coast, and to wait the day without noise. On the morrow, as soon as the sun was risen, the Athenians began to row towards them with their whole fleet in one line, and to bid them defiance. Lysander, though his ships were ranged in order of battle, with their heads towards the enemy, lay still without making any movement. In the evening, when the Athenians withdrew, he did not suffer his soldiers to go ashore, till two or three galleys, which he had sent out to observe them, were returned with advice that they had seen the enemy land. The next day passed in the same manner, as they did the third and fourth. Such a conduct, which argued reserve and apprehension, extremely augmented the security and boldness of the Athenians, and inspired them with an extreme contempt for an army, which fear, in their sense, prevented from showing themselves, and attempting any thing.

Whilst this passed, Alcibiades, who was near the fleet, took horse, and came to the Athenian generals; to whom he represented, that they kept upon a very disadvantageous coast, where there were neither ports nor cities in the neighbourhood; that they were obliged to bring their provisions from Cestos with great danger and difficulty; and that they were very much in the wrong to suffer the soldiers and mariners of the fleet, as soon as they were ashore, to straggle and disperse themselves at their own pleasure, whilst they were faced in view by the enemy's fleet, accustomed to execute the orders of their general with the readiest obedience, and upon the slightest signal. He offered also to attack the enemy by land with a strong body of Thracian troops, and to force them to a battle. The generals, especially Tydeus and Menander, jealous of their command, did not content themselves with refusing his offers, from the opinion, that if the event proved unfortunate, the whole blame would fall on them, and if favourable, that Alcibiades alone would have the honour of it; but rejected also with insult his wife and salutary counsel, as if a man in disgrace lost his sense and abilities with the favour of the common-wealth. Alcibiades withdrew.

The fifth day the Athenians presented themselves again, and offered battle; retiring in the evening according to custom with more insulting airs than the days before. Lysander, as usual, detached some galleys to observe them, with orders to return with the utmost

Egyptus || *Egyptilla*. utmost diligence when they saw the Athenians landed, and to put up a brazen buckler at each ship's head as soon as they reached the middle of the channel. Himself in the mean time ran through the whole line in his galley, exhorting the pilots and officers to hold the seamen and soldiers in readiness to row and fight on the first signal.

As soon as the bucklers were put up in the ships heads, and the admiral galley had given the signal by the sound of trumpet, the whole fleet set forward in good order. The land-army at the same time made all possible haste to the top of the promontory to see the battle. The strait that separates the two continents in this place is about fifteen stadia, or three quarters of a league in breadth; which space was presently cleared through the activity and diligence of the rowers. Conon the Athenian general was the first who perceived from shore, that fleet advance in good order to attack him; upon which he immediately cried out for the troops to embark. In the height of sorrow and trouble, some he called to by their names, some he conjured, and others he forced to go on board their galleys; but all his endeavours and emotions were ineffectual, the soldiers being dispersed on all sides. For they were no sooner come on shore, than some run to the sutlers, some to walk in the country, some to sleep in their tents, and others had begun to dress their suppers. This proceeded from the want of vigilance and experience in their generals, who, not suspecting the least danger, indulged themselves in their taking repose, and gave their soldiers the same liberty.

The enemy had already fallen on with loud cries and a great noise of their oars, when Conon, disengaging himself with nine galleys, of which number was the sacred ship called the *Paralian*, stood away for Cyprus, where he took refuge with Evagoras. The Peloponnesians, falling upon the rest of the fleet, took immediately the galleys which were empty, and disabled and destroyed such as began to fill with men. The soldiers, who ran without order or arms to their relief, were either killed in the endeavour to get on board, or flying on shore were cut to pieces by the enemy, who landed in pursuit of them. Lysander took 3000 prisoners, with all the generals, and the whole fleet. After having plundered the camp, and fastened the enemy's galleys to the sterns of his own, he returned to Lampacus amidst the sound of flutes and songs of triumph. It was his glory to have achieved one of the greatest military exploits recorded in history with little or no loss, and to have terminated a war in the small space of an hour, which had already lasted 27 years, and which, perhaps, without him, had been of much longer continuance.

ÆGYPT. See EGYPT.

ÆGYPTIACUM, in pharmacy, the name of several detergent ointments; which are described under the article OINTMENT.

ÆGYPTILLA, in natural history, the name of a stone described by the ancients, and said, by some authors, to have the remarkable quality of giving water the colour and taste of wine. This seems a very imaginary virtue, as are indeed too many of those in former ages attributed to stones. The descriptions left us of this remarkable fossil tell us, that it was variegated

with, or composed of, veins of black and white, or black and bluish, with sometimes a plate or vein of whitish red. The authors of these accounts seem to have understood by this name the several stones of the onyx, sardonyx, and camæa kind; all which we have at present common among us, but none of which possess any such strange properties.

ÆGYPTUS (fab. hist.), was the son of Belemus, and brother of Danaus. See BELIDES.

ÆINATÆ, in antiquity, a denomination given to the senators of Miletus, because they held their deliberations on board a ship, and never returned to land till matters had been agreed on.

ÆLIAN (Claudius), born at Præneste in Italy. He taught rhetoric at Rome, according to Perizonius, under the emperor Alexander Severus. He was surnamed *Μελιγλωσσος*, *Honey-mouth*, on account of the sweetness of his style. He was likewise honoured with the title of *Sophist*, an appellation in his days given only to men of learning and wisdom. He loved retirement, and devoted himself to study. He greatly admired and studied Plato, Aristotle, Isocrates, Plutarch, Homer, Anacreon, Archilochus, &c. and, though a Roman, gives the preference to the writers of the Greek nation. His two most celebrated works are, his *Various History*, and *History of Animals*. He composed likewise a book on Providence, mentioned by Eustathius; and another on Divine Appearances, or The Declarations of Providence. There have been several editions of his *Various History*.

ÆLI PONS (anc. geog.), one of the fortresses near the wall or rampart, or, in the words of the Notitia, through the line of the hither wall; built, as is thought, by Adrian*. Now Porteland, (Camden), in North-
* See Adrian (emperor.)
umberland, between Newcastle and Morpeth.

ÆLIUS PONS, now *il Ponte S. Angelo*, a stone-bridge at Rome, over the Tyber, which leads to the Burgo and Vatican from the city, along Adrian's mole, built by the emperor Adrian.

ÆLFRED. See ALFRED.

ÆLURUS, in Egyptian mythology, the deity or god of cats; represented sometimes like a cat, and sometimes like a man with a cat's head. The Egyptians had so superstitious a regard for this animal, that the killing it, whether by accident or design, was punished with death: and Diodorus relates, that, in the time of extreme famine, they chose rather to eat one another than touch these sacred animals.

ÆM, AM, or AME, a liquid measure used in most parts of Germany; but different in different towns; the æm commonly contains 20 vertils, or 80 masses; that of Heidelbergh is equal to 48 masses; and that of Wirtembergh to 160 masses. See AAM.

ÆMILIUS (Paulus), the son of Lucius Paulus, who was killed at the battle of Cannæ, was twice consul. In his first consulate he triumphed over the Ligurians; and in the second subdued Perseus king of Macedonia, and reduced that country to a Roman province, on which he obtained the surname of Macedonicus. He returned to Rome loaded with glory, and triumphed for three days. He died 168 years before Christ.

ÆMILIUS (Paulus), a celebrated historian, born at Verona, who obtained such reputation in Italy, that he was invited into France by the cardinal of Bourbon, in
the

Æmoli-
um
||
Æneid.

the reign of Louis XII. in order to write the history of the kings of France in Latin, and was given a canonry in the cathedral of Paris. He was near 30 years in writing that history, which has been greatly admired; and died at Paris on the 5th of May 1529.

ÆMOBOLIUM, in antiquity, the blood of a bull or ram offered in the sacrifices, called *taurobolia* and *criobolia*; in which sense the word occurs in ancient inscriptions.

ÆNARIA (anc. geog.), an island on the bay of Cumæ, or over-against Cumæ in Italy, (Pliny). It is also called *Inarime*, (Virgil); and now *Ischia*: scarce three miles distant from the coast, and the promontory Misenus to the west; 20 miles in compass; called *Pitheculæ* by the Greeks. It is one of the Oenotrides, and fenced round by very high rocks, so as to be inaccessible but on one side; it was formerly famous for its earthen ware. See ISCHIA.

ÆNEAS (fab. hist.), a famous Trojan prince, the son of Anchises and Venus. At the destruction of Troy, he bore his aged father on his back, and saved him from the Greeks; but being too solicitous about his son and household-gods, lost his wife Creusa in the escape. Landing in Africa, he was kindly received by queen Dido: but quitting her coast, he arrived in Italy, where he married Lavinia the daughter of king Latinus, and defeated Turnus, to whom she had been contracted. After the death of his father-in-law, he was made king of the Latins, over whom he reigned three years: but joining with the Aborigines, he was slain in a battle against the Tuscans. Virgil has rendered the name of this prince immortal, by making him the hero of his poem. See ÆNEID.

ÆNEAS SYLVIUS (Pope). See PIUS II.

ÆNEATORES, in antiquity, the musicians in an army, including those who played trumpets, horns, &c. The word is formed from *æneus*, on account of the brazen instruments used by them.

Blair's Lec-
tures.

ÆNEID, the name of Virgil's celebrated epic poem. The subject of the Æneid, which is the establishment of Æneas in Italy, is extremely happy. Nothing could be more interesting to the Romans than to look back to their origin from so famous a hero. While the object was splendid itself, the traditionary history of his country opened interesting fields to the poet; and he could glance at all the future great exploits of the Romans, in its ancient and fabulous state,

As to the unity of action, it is perfectly well preserved in the Æneid. The settlement of Æneas, by the order of the gods, is constantly kept in view. The episodes are linked properly with the main subject. The nodus, or intrigue of the poem, is happily managed. The wrath of Juno, who opposes Æneas, gives rise to all his difficulties, and connects the human with the celestial operations throughout the whole poem.

One great imperfection of the Æneid, however, is, that there are almost no marked characters in it. Achates, Cloanthus, Gyas, and other Trojan heroes who accompanied Æneas into Italy, are insipid figures. Even Æneas himself is without interest. The character of Dido is the best supported in the whole Æneid.

The principal excellency of Virgil is tenderness. His soul was full of sensibility. He must have felt himself all the affecting circumstances in the scenes he describes; and he knew how to touch the heart by a single

stroke. In an epic poem this merit is the next to sublimity. The second book of the Æneid is one of the greatest master-pieces that ever was executed. The death of old Priam, and the family-pieces of Æneas, Anchises, and Creusa, are as tender as can be conceived. In the fourth book, the unhappy passion and death of Dido are admirable. The episodes of Pallas and Evander, of Nisus and Euryalus, of Lausus and Mezentius, are all superlatively fine.

In his battles, Virgil is far inferior to Homer. But in the important episode, the descent into hell, he has outdone Homer by many degrees. There is nothing in antiquity to equal the sixth book of the Æneid.

ÆNGINA, one of the islands of the Archipelago. It lies in the bay of Engia, and the town of that name contains about 800 houses and a castle; and near it are the ruins of a magnificent structure, which was probably a temple.

ÆNIGMA, denotes any dark saying, wherein some well-known thing is concealed under obscure language. The word is Greek, *αἰνίγμα*, formed of *αἰνίσθαι*, *obscure innuere*, to hint a thing darkly, and of *αἶνος*, an obscure speech or discourse. The popular name is *riddle*; from the Belgic *raeden*, or the Saxon *araethan*, to interpret. Fa. Bouhours, in the memoirs of Trevoux, defines an *ænigma*, A discourse or painting, including some hidden meaning, which is proposed to be guessed.

Painted ÆNIGMAS, are representations of the works of nature or art, concealed under human figures, drawn from history or fable.

A Verbal ÆNIGMA, is a witty, artful, and abstruse description of any thing.—In a general sense, every dark saying, every difficult question, every parable, may pass for an *ænigma*. Hence obscure laws are called *Ænigmata Juris*. The alchemists are great dealers in the *æigmatic* language, their processes for the philosophers stone being generally wrapped up in riddles: e. g. *Fac ex mare et sæmina circum, inde quadrangulum, hinc triangulum, fac circum, et habebis lapidem philosophorum*.—F. Menestrier has attempted to reduce the composition and resolution of *ænigmas* to a kind of art, with fixed rules and principles, which he calls the philosophy of *æigmatic* images.

The Subject of an ÆNIGMA, or the thing to be concealed and made a mystery of, he justly observes, ought not to be such in itself: but, on the contrary, common, obvious, and easy to be conceived. It is to be taken, either from nature, as the heavens or stars; or from art, as painting, the compass, a mirror, or the like.

The form of ÆNIGMAS consists in the words, which, whether they be in prose or verse, contain either some description, a question, or a prosopopœia. The last kind are the most pleasing, inasmuch as they give life and action to things which otherwise have them not. To make an *ænigma*, therefore, two things are to be pitched on, which bear some resemblance to each other; as the sun and a monarch; or a ship and a house: and on this resemblance is to be raised a superstructure of contrarieties to amuse and perplex. It is easier to find great subjects for *ænigmas* in figures than in words, inasmuch as painting attracts the eyes and excites the attention to discover the sense. The subjects of *ænigmas* in painting, are to be taken either from history or fable: the composition here is a kind of metamorphosis,

Ængina,
Ænigma.

Ænigma. tamorphosis, wherein, e. g. human figures are changed into trees, and rivers into metals. It is essential to ænigmas, that the history or fable, under which they are presented, be known to every body; otherwise it will be two ænigmas instead of one; the first of the history or fable, the second of the sense in which it is to be taken. Another essential rule of the ænigma is, that it only admit of one sense. Every ænigma which is susceptible of different interpretations, all equally natural, is so far imperfect. What gives a kind of erudition to an ænigma, is the invention of figures in situations, gestures, colours, &c. authorised by passages of the poets, the customs of artists in statues, basso relievos, inscriptions, and medals.—In foreign colleges,

The Explication of ÆNIGMAS makes a considerable exercise; and that one of the most difficult and amusing, where wit and penetration have the largest field.—By explaining an ænigma, is meant the finding a motto corresponding to the action and persons represented in a picture, taken either from history or mythology. The great art of this exercise consists in the choice of a motto, which either by itself, or the circumstances of time, place, persons who speak, or those before whom he is speaking, may divert the spectators, and furnish occasion for strokes of wit; also in showing to advantage the conformities between the figure and thing figured, giving ingenious turns to the reasons employed to support what is advanced, and in artfully introducing pieces of poetry to illustrate the subject and awaken the attention of the audience.

As to the solution of ænigmas, it may be observed, that those expressed by figures are more difficult to explain than those consisting of words, by reason images may signify more things than words can; so that to fix them to a particular sense, we must apply every situation, symbol, &c. and without omitting a circumstance.—As there are few persons in history, or mythology, but have some particular character of vice or virtue, we are, before all things, to attend to this character, in order to divine what the figure of a person represented in a painting signifies, and to find what agreement this may have with the subject whereof we would explain it. Thus, if Proteus be represented in a picture, it may be taken to denote *inconstancy*, and applied either to a physical or moral subject, whose character is to be changeable; e. g. an almanack, which expresses the weather, the seasons, heat, cold, storms, and the like. The colours of figures may also help to unriddle what they mean: *white*, for instance, is a mark of innocence, *red* of modesty, *green* of hope, *black* of sorrow, &c. When figures are accompanied with symbols, they are less precarious; these being, as it were, the soul of ænigmas, and the key that opens the mystery of them. Of all the kinds of symbols which may be met with in those who have treated professedly on the subject, the only truly ænigmatical are those of Pythagoras, which, under dark proverbs, hold forth lessons of morality; as when he says, *State-ram ne transilias*, to signify, Do no injustice.

But it must be added, that we meet with some ænigmas in history, complicated to a degree, which much transcends all rules, and has given great perplexity to the interpreters of them. Such is that celebrated ancient one, *Ælia Lælia Crispis*, about which many of the learned have puzzled their heads. There are two

exemplars of it: one found 140 years ago, on a marble near Bologna: the other in an ancient MS. written in Gothic letters, at Milan. It is controverted between the two cities, which is to be reputed the more authentic.

The Bononian *Ænigma.*

D. M.

Ælia Lælia Crispis,
Nec vir, nec mulier,
Nec androgyna;
Nec puella, nec juvenis,
Nec anus;
Nec casta, nec meretrix,
Nec pudica;
Sed omnia:
Sublata
Neque fame, neque ferro,
Neque veneno;
Sed omnibus:
Nec cælo, nec terris,
Nec aquis,
Sed ubique jacet.
Lucius Agatho Priscius,
Nec maritus, nec amator,
Nec necessarius;
Neque mærens, neque gaudens,
Neque flens;
Hanc,
Nec molem, nec pyramidem,
Nec sepulchrum,
Sed omnia,
Scit et nescit, cui posuerit.

That is to say, *To the gods manes, Ælia Lælia Crispis, neither man, nor woman, nor hermaphrodite; neither girl, nor young woman, nor old; neither chaste, nor a whore; but all these: killed neither by hunger, nor steel, nor poison; but by all these: rests neither in heaven, nor on earth, nor in the waters; but every where. Lucius Agatho Priscius, neither her husband, nor lover, nor friend; neither sorrowful, nor joyful, nor weeping, certain, or uncertain, to whom he rears this monument, neither erects her a temple, nor a pyramid, nor a tomb, but all these. In the MS. at Milan, instead of D. M. we find A. M. P. P. D. and at the end the following addition:*

Hoc est sepulchrum intus cadaver non habens,
Hoc est cadaver sepulchrum extra non habens,
Sed cadaver idem est et sepulchrum.

We find near 50 several solutions of this ænigma advanced by learned men. Marius Michael Angelus maintains *Ælia Lælia Crispis* to signify rain-water falling into the sea. Ri. Vitus first explained it of Niobe turned to a stone, afterwards of the rational soul, and afterwards of the Platonic idea; Jo. Turrius, of the *materia prima*; Fr. Schottus, of an eunuch; Nic. Bernardus, of the philosophers-stone, in which he is followed by Borrichius; Zach. Pontinus, of three human bodies in the same situation, and buried by three different men at the same time; Nesmondus, of a law-suit; Jo. Gas. Gerartius, of love; Zu. Boxhornius, of a shadow; P. Terronus, of music; Fort Licetus, of generation, friendship, and privation; M. Ov. Montalbanus, of hemp; Car. Cæf. Malvasia, of an abortive girl promised in marriage; Pet. Mengulus, of the rule of chastity, prescribed by the founder of the military

Ænigmatography || *Æolipile.*
military religion of St Mary; M. de Ciconia, of pope Joan; Heumannus, of Lot's wife; and lastly, J. C. S. an anonymous writer in the Leipzig Acts, of the Christian church.

ÆNIGMATOGRAPHY, or **ÆNIGMATHOLOGY**, the art of resolving or making ænigmas.

ÆNONA (anc. geog.), a city of Liburnia, called by Pliny *Civitas Prasini*, the reason of which is unknown; also *Enona*, and is now called *Nona*; on the Adriatic, by which it is for the greater part surrounded; over-against the island Gissa, from which it is distant four miles to the west. E. Long. 16°, Lat. 28°.

ÆNUS (anc. geog.), now the *Inn*, a river of Germany, which, rising in the country of the Grisons, out of the Alps, in the district called Gottes-haus-punt, runs through the Grisons, the county of Tyrol, the duchy of Bavaria, and through Passau into the Danube.

ÆNUS *Ænos*, or *Ænum* (anc. geog.), a town of Thrace, situate on the east-most mouth of the Hebrus, which has two mouths; and said to be built by the Cumæans. It was a free town, in which stood the tomb of Polydorus, (Pliny); *Ænius* is the epithet. Here the brother of Cato Uticensis died, and was honoured with a monument of marble in the form of the *Ænii*, (Plutarch); called *Ænii*, (Stephanus); Livy says that the town was otherwise called *Absynthus*. Now *Eno*.

ÆNITHOLOGUS, in poetry, a verse of two dactyls and three trochæi; as, *Prælia dira placent truci juventæ*.

ÆOLIAE INSULÆ, now *Isole di Lipari*, (anc. geog.), seven islands, situated between Sicily and Italy, so called from *Æolus*, who reigned there about the time of the Trojan war. The Greeks call them *Hephestiades*; and the Romans *Vulcaniæ*, from their fiery eruptions. They are also called *Liparæorum Insula*, from their principal island Lipara. Dionysius Periegetes calls them *Πλυαί*, because circumnavigable.

ÆOLIC, in a general sense, denotes something belonging to *Æolis*.

ÆOLIC, or **ÆOLIAN**, in grammar, denotes one of the five dialects of the Greek tongue. It was first used in Bœotia; whence it passed into *Æolia*, and was that which Sappho and Alcæus wrote in. The *Æolic* dialect generally throws out the aspirate or sharp spirit, and agrees in so many things with the *Doric* dialect, that the two are usually confounded together.

The *Æolic digama* is a name given to the letter F, which the *Æolians* used to prefix to words beginning with vowels, as *Foivos*, for *oiv*; also to insert between vowels, as *oFis*, for *ois*.

ÆOLIC Verse, in prosody, a verse consisting of an iambus, or spondee; then of two anapests, separated by a long syllable; and, lastly, of another syllable. Such as, *O stelliferi conditor orbis*. This is otherwise called *eulogic* verse; and, from the chief poets who used it, *Archilochian* and *Pindaric*.

ÆOLIPILE, in hydraulics, is a hollow ball of metal, generally used in courses of experimental philosophy, in order to demonstrate the possibility of converting water into an elastic steam or vapour by heat. The instrument, therefore, consists of a slender neck, or pipe, having a narrow orifice inserted into the ball by means of a shouldered screw. This pipe being taken out, the ball is filled almost full of water, and the pipe

being again screwed in, the ball is placed on a pan of kindled charcoal, where it is well heated, and there issues from the orifice a vapour, with prodigious violence and great noise, which continues till all the included water is discharged. The stronger the fire is, the more elastic and violent will be the steam; but care must be taken that the small orifice of the pipe be not, by any accident, stopped up; because the instrument would in that case infallibly burst in pieces, with such violence as may greatly endanger the lives of the persons near it. Another way of introducing the water is to heat the ball red-hot when empty, which will drive out almost all the air; and then by suddenly immersing it in water, the pressure of the atmosphere will force in the fluid, till it is nearly full. Des Cartes and others have used this instrument to account for the natural cause and generation of the wind: and hence it was called *Æolopila*: q. d. *pila Æoli*, the ball of *Æolus* or of the god of the winds.

ÆOLIS, or **ÆOLIA** (anc. geog.), a country of the Hither Asia, settled by colonies of *Æolian* Greeks. Taken at large, it comprehends all Troas, and the coast of the Hellespont to the Propontis, because in those parts there are several *Æolian* colonies: more strictly, it is situated between Troas to the north, and Ionia to the south. The people are called *Æoles* or *Æolii*.

ÆOLIUM MARE (anc. geog.), a part of the Egean sea, washing *Æolis*; called also *Mygium*, from *Myfia*. Now called, *Golfo di Smyrna*.

ÆOLUS, in heathen mythology, the god of the winds, was said to be the son of Jupiter by Acasta, or Sigesia, the daughter of Hippotus: or, according to others, the son of Hippotus by Meneclea, daughter of Hyllus king of Lipara. He dwelt in the island Strongyle, now called *Strombolo*, one of the seven islands called *Æolian* from their being under the dominion of *Æolus*. Others say, that his residence was at Regium, in Italy; and others again place him in the island Lipara. He is represented as having authority over the winds, which he held enchained in a vast cavern, to prevent their continuing the devastations they had been guilty of before they were put under his direction. Mythologists explain the original of these fables, by saying, that he was a wise and good prince; and, being skilled in astronomy, was able, by the flux and reflux of the tides, and the nature of the volcano in the island Strongyle, to foretel storms and tempests.

Harp of ÆOLUS, or the *Æolian lyre*, See *Acoustics*, n° 10.

ÆON, a Greek word, properly signifying the age or duration of any thing.

ÆON, among the followers of Plato, was used to signify any virtue, attribute, or perfection: hence they represented the deity as an assemblage of all possible æons; and called him *pleroma*, a Greek term signifying *fullness*. The Valentinians, who, in the first ages of the church, blended the conceits of the Jewish cabalists, the Platonists, and the Chaldean philosophers, with the simplicity of the Christian doctrine, invented a kind of Theogony, or Genealogy of Gods (not unlike that of Hesiod), whom they called by several glorious names, and all by the general appellation of *Æons*: among which they reckoned *Ζωή*, *Life*; *Λόγος*, *Word*; *Μονογενής*, *Only-begotten*; *Πληρωμα*, *Fullness*; and many other divine powers and emanations, amounting in

Æolis
||
Æon.

Æora in number to thirty: which they fancied to be successively derived from one another; and all from one self-originated deity, named *Bythus*, i. e. *profound* or *unsathomable*; whom they called likewise, *The most high and ineffable Father*. See VALENTINIANS.

ÆORA, among ancient writers on medicine, is used for gestation; which sort of exercise was often prescribed by the physicians of those days. Other exercises consisted principally in the motion of the body; but in the *æora* the limbs were at rest, while the body was carried about and moved from place to place, in such a manner as the physician prescribed. It had therefore the advantages of exercise, without the fatigue of it.—This exercise was promoted several ways: sometimes the patient was laid in a sort of hammock, supported by ropes, and moved backward and forward; sometimes his bed run nimbly on its feet. And beside these, the several ways of travelling were accounted species of the *æora*, whether in the litter, in a boat or ship, or on even ground in a chariot.—Asclepiades was the first who brought gestation into practice, which was used as a means to recover strength after a fever, &c.

ÆQUANA JUGA, (anc. geog.); mountains of Picenum, in the kingdom of Naples, now called *Montagna di Sorrento*, denominated from the town *Æqua*, which being destroyed, was replaced by *Vicus*, now *Vico di Sorrento*; called also *Æquana*, Sil. Italicus.

ÆQUIMELIUM, in antiquity, a place in Rome, where stood the house of Spurius Melius, who, by largesses corrupting the people, affected the supreme power: refusing to appear before the dictator Cincinnatus, he was slain by Servilius Ahala, master of the horse; his house was razed to the ground; and the spot on which it stood was called *Area Equimelii*, (Livy.).

ÆRA, in chronology, a fixed point of time from whence any number of years is begun to be counted.

It is sometimes also written in ancient authors *Era*. The origin of the term is contested, though it is generally allowed to have had its rise in Spain. Sepulveda supposes it formed from A. ER. A. the notæ or abbreviations of the words, *annus erat Augusti*, occasioned by the Spaniards beginning their computation from the time their country came under the dominion of Augustus, or that of receiving the Roman calendar. This opinion, however ingenious, is rejected by Scaliger, not only on account that in the ancient abbreviations A never stood for *annus*, unless when preceded by V for *vixit*; and that it seems improbable they should put ER for *erat*, and the letter A, without any discrimination, both for *annus* and *Augustus*. Vossius nevertheless favours the conjecture, and judges it at least as probable, as either that of Isidore, who derives *æra* from *as*, the “tribute-money,” wherewith Augustus taxed the world: or that of Scaliger himself, who deduces it likewise from *as*, though in a different manner. *Æs*, he observes, was used among the ancients for an *article* or *item* in an account; and hence it came also to stand for a sum or number itself. From the plural *æra*, came by corruption *era*, *eram*, in the singular; much as *Ostia*, *Ostiam*, the name of a place, from *Ostia*, the mouths of the Tyber.

The difference between the terms *æra* and *epoch* is, that the *æras* are certain points fixed by some people,

or nation; and the epochs are points fixed by chronologists and historians. The idea of an *æra* comprehends also a certain succession of years proceeding from a fixed point of time, and the epoch is that point itself. Thus the Christian *æra* began at the epoch of the birth of Jesus Christ. See CHRONOLOGY, where the different Eras, &c. are enumerated and explained.

ÆRARIUM, the treasury or place where the public money was deposited amongst the Romans.

ÆRARIUM Sanctius contained the monies arising from the twentieth part of all legacies: this was kept for the extreme necessities of the state.

ÆRARIUM Privatum was the emperor's privy purse, or the place where the money arising from his private patrimony was deposited.

ÆRARIUM Vicefimarum, the place where the money arising from the taxes levied from foreign countries was laid up, so called because it most commonly consisted of a twentieth part of the produce.

ÆRARIUM Ilithyæ, or *Junonis Lucina*, was where the monies were deposited which parents paid for the birth of each child.

There are several other treasuries mentioned in history, as the *ærarium Juventutis*, *Veneris*, &c. The temple of Saturn was the public treasury of Rome, either because Saturn first taught the Italians to coin money, or, which is most likely, because this temple was the strongest and most secure, and therefore the fittest place for that purpose.

Ærarium differs from *fiscus*, as the first contained the public money, the second that of the prince. The two are, however, sometimes indiscriminately used for each other.

ÆRARIUS, a name given by the Romans to a degraded citizen, who had been struck off the list of his century. Such persons were so called because they were liable to all the taxes (*æra*), without enjoying any of its privileges.

The *ærarii* were incapable of making a will, of inheriting, of voting in assemblies, of enjoying any post of honour or profit; in effect, were only subject to the burdens without the benefits of society; yet they retained their freedom, and were not reduced to the condition of slaves. To be made an *ærarius* was a punishment inflicted for some offence, and reputed one degree more severe than to be expelled a tribe, *tribus moveri*.

ÆRARIUS was also an officer instituted by Alexander Severus, for the distribution of the money given in largesses to the soldiery, or people.

ÆRARIUS was also used for a person employed in coining or working brass.

These are sometimes called *ærarii fusores*: at other times, *ærarius* is distinguished from *fusor*; the former answering to what we now call copper-smiths, the latter to founders.

ÆRARIUS was likewise applied to a soldier who receives pay.

ÆRIA, or **ÆRIA** (anc. geog.), the ancient name of Egypt: the scholiast on Apollonius Rhodius, says, that not only Thessaly, but Egypt, was called *Æγρία* by the Greeks, which Eusebius also confirms: and hence Appollinarius, in his translation of the 114th Psalm, uses it for Egypt. Heyschius applies this name to Ethiopia.

AERIAL,

Ærarium
||
Aerial.

Aerial,
Aerians.

AERIAL, in a general sense, denotes something partaking of the nature of air; thus aerial substance, aerial particles, &c.

AERIAL Perspective. See PERSPECTIVE and PAINTING.

AERIANS, in church history, a branch of Arians, who, to the doctrines of that sect, added some peculiar dogmas of their own; as, that there is no difference between bishops and priests; a doctrine maintained by many modern divines, particularly of the presbyterian and reformed churches. The sect received its denomination from Aërius an Armenian priest of the fourth century. He founded his doctrine chiefly upon some passages in St Paul; and, among others, upon that in 1 Tim. iv. 14. where the apostle exhorts him not to neglect the gift he had received by the laying on of the hands of the Presbytery. Here, observes Ae-

rius, are no mention of bishops: on the contrary, Timothy evidently received his ordination from the presbyters or priests.—Epiphanius zealously maintains the superiority of bishops against the Aerians. The word *presbytery*, used by the apostle, he observes, includes both bishops and priests; the whole senate or assembly of the ecclesiastics of the place.

FLOS ÆRIS, among alchemists, small scales procured from copper melted by a strong heat; it is sometimes used for ærugo or verdigrise.

AEROGRAPHY, from *αἰρ*, air, and *γραφω*, I describe; a description of the air, or atmosphere, its limits, dimensions, properties, &c. This amounts to much the same with aerology, unless we suppose the latter to enter into the rational, and the former to confine itself to a description of the more obvious affections thereof. See ATMOSPHERE.

Flos Æris,
Aerography.

A E R O L O G Y,

THE doctrine or science of AIR, its nature and different species, with their ingredients, properties, phenomena, and uses.

Air, in a general sense, is that invisible fluid everywhere surrounding this globe; on which depends not only animal but vegetable life; and which seems, in short, to be one of the great agents employed by nature in carrying on her operations throughout the world.

Though the attention of philosophers has in all ages been engaged in some measure by inquiries concerning the nature of the atmosphere, yet till within these last 30 years, little more than the mere mechanical action of this fluid was discovered, with the existence of some anomalous and permanently elastic vapours, whose properties and relation to the air we breathe were almost entirely unknown. Within the above-mentioned period, however, the discoveries concerning the constituent parts of the atmosphere itself, as well as the nature of the different permanently elastic fluids which go under the general name of *air*, have been so numerous and rapid, that they have at once raised this subject to the dignity of a *Science*, and now form a very considerable, as well as important, part of the modern system of natural philosophy.

Utility of the subject. Those discoveries, indeed, have not been more interesting to philosophers, than useful to science and beneficial to society. Many perplexing processes in chemistry have been explained in consequence of them, several have been facilitated, and a number of new and useful ones have been introduced. The phenomena attending metallic calcinations and reductions have been greatly elucidated. The knowledge of the use of the air in respiration; the method of ascertaining its purity and fitness for that function; the investigation of dephlogisticated air; the method of impregnating water with fixed air; are all calculated to answer purposes of the highest utility. The medicinal properties of fixed air have been in a great measure ascertained, and its antiseptic qualities in other respects promise to be of considerable advantage. The method of ascertaining the purity of the air of a place, and the manner of ventilating an apartment, are of

Nº 4.

great use for those concerned in public buildings. In short, there is perhaps no station in life where some knowledge of this subject may not be of use.

SECT. I. Of the general Constitution, Mechanical Properties, and Operations of the Air.

§ 1. The general Constitution of the Air we breathe.—

For many ages this fluid was supposed to be simple and homogeneous; its common operations to depend on its heat, cold, moisture, or dryness; and any effects which could not be explained by these (such as the appearance of pestilential diseases), were reckoned to be entirely supernatural, and the immediate effects of Divine power. But, however simple and homogeneous this fluid may have been thought in former times, it is so far from possessing the simplicity of an element, that it is the receptacle of all kinds of effluvia produced from terrestrial substances either naturally or artificially. Hence, whatever may be the nature of the aerial fluid when absolutely pure, that which we breathe, and commonly goes under the name of *air*, must be considered as an exceedingly heterogeneous mixture, various at various times, and which it is by no means possible to analyse with accuracy.

Though, in this view, air seems to be a kind of sink or common sewer, where all the poisonous effluvia arising from putrid and corrupted matters are deposited; yet it has a wonderful facility of purifying itself, and one way or other of depositing those vapours contained in it; so that it never becomes noxious except in particular places, and for a short time; the general mass remaining upon all occasions pretty much the same. The way in which this purification is effected is different, according to the nature of the vapour with which the air is loaded. That which most universally prevails is water; and from experiments it appears, that the quantity of aqueous vapour contained in the atmosphere is immense. Dr Halley, from an experiment on the evaporation from a fluid surface heated to the same degree with that given by our meridian sun, has calculated, that the evaporation from the Mediterranean sea alone is sufficient to yield all the water of the

1
Ancient opinions concerning the air.

2
Common air a very heterogeneous fluid.

3
In what manner it purifies itself.

4
Vast quantities of water continually discharged into it by evaporation.

Of Air
in general.

the rivers which run in to it. Dr Watson, in his Chemical Essays, has given an account of some experiments made with a view to determine the quantity of the water raised from the earth itself in time of drought. He informs us, that when there had been no rain for above a month, and the grass was become quite brown and parched, the evaporation from an acre was not less than 1600 gallons in 24 hours. Making afterwards two experiments, when the ground had been wetted by a thunder-shower the day before, the one gave 1973, the other 1905, gallons in 12 hours. From this the air is every moment purified by the ascent of the vapour, which flying off into the clouds, thus leaves room for the exhalation of fresh quantities; so that as the vapour is considerably lighter than the common atmosphere, and of consequence ascends with great velocity, the air during all this time is said to be *dry*, notwithstanding the vast quantity of aqueous fluid that passes through it.

5
Different
kinds of va-
pours which
contami-
nate it.

Nor is it only from the aqueous vapour that the air is purified at this time. Much of that vapour arising from decayed and putrid animal and vegetable substances, and which by some modern philosophers is called *phlogiston*, attaches itself to the aqueous vapour, and ascends along with it. Another part is absorbed by vegetables; for the phlogistic vapour, as is shown under AGRICULTURE, n° 5. is probably the food of plants. The phlogistic vapours which ascend along with the water, probably continue there and descend along with the rain; whence the fertilizing qualities of rain-water above those of any other. Thus we may see why a dry air, whether cold or hot, must always be wholesome; but as the atmosphere cannot always receive vapours, it is obvious, that when great rains come on, especially if attended with heat, the lower regions of the air must be overloaded with vapours both of the aqueous and phlogistic kind, and of consequence be very unwholesome.

But besides the aqueous and phlogistic vapours, both of which are specifically lighter than common air, there are others, which, being specifically heavier, cannot be carried off in this manner. Hence these gross vapours contaminate certain places of the atmosphere, rendering them not only unhealthy, but absolutely poisonous. Of these are, 1. Sulphureous, acid, and metalline exhalations. These are produced principally by volcanoes; and as they descend, in consequence of their specific gravity, they suffocate and spread destruction all around them, poisoning not only animals, but vegetables also. 2. The vapours arising from houses where lead and other metals are smelted, have the same pernicious qualities; insomuch that the men who breathe them, the cattle who eat the grass, and the fishes who inhabit the waters on which they fall, are poisoned by them if taken into the body in a certain proportion. 3. Of the same kind are the *mofetes*, or emanations of fixed air, which sometimes proceed from old lavas, or perhaps from some other places even of the surface. From all these the air seems not capable of purifying itself, otherwise than either by dispersing them by winds, or by letting them subside by their superior gravity, till they are absorbed either by the earth or water, according as it is their nature to unite with one or other of these elements. 4. Of this kind also seem to be the vapours which are called

properly *pestilential*. The contagion of the plague itself seems to be of an heavy sluggish nature, incapable of arising in the air, but attaching itself to the walls of houses, bed-cloaths, and wearing apparel. Hence scarce any constitution of the atmosphere can dispel these noxious effluvia; nor does it seem probable that pestilential distempers ever cease until the contagion has operated so long, and been so frequently communicated from one to another, that, like a ferment much exposed to the atmosphere, it becomes vapid, communicates a milder infection, and at last loses its strength altogether.

Of Air
in general.

6
§ 2. *Mechanical Properties of the Air*.—In common with water, the air we breathe possesses gravity, and consequently will perform every thing in that way which water can do, making allowance for the great difference between the specific gravity of water and of air. This difference indeed is exceedingly great, and has been variously calculated. Ricciolus estimates the gravity of air to be that of water as 1 to 1000; Merfennus, as 1 to 1300, or 1 to 1356; Lana, as 1 to 640; and Galileo, only as 1 to 400. Mr Boyle, by more accurate experiments, makes the air at London to be to water as 1 to 938; and thinks, that, all things considered, the proportion of 1 to 1000 may be taken as a medium. But by three experiments made since that time before the Royal Society, the specific gravity of the air was determined to be to that of water as 1 to 840, 852, and 860. By a very accurate experiment, Mr Hawksbee fixed the proportion as 1 to 885. But as all these experiments were made when the barometer was at 29½ inches, Dr Jurin supposes, that, at a medium between heat and cold, when the barometer is 30 inches high, the proportion between the two fluids may be taken as 1 to 800; and this agrees with the observations of the Hon. Mr Cavendish, made when the barometer was at 29½ inches, and the thermometer at 50.

By mean of its gravity, the air presses with great force upon all bodies, according to the extent of their surface. M. Pascal has computed the quantity of this pressure to be no less than 2232 pounds upon every square foot of surface, or upwards of 15 pounds on every square inch. According to some experiments made by M. Amontons and de la Hire, a column of air on the surface of the earth, and 36 fathoms high, is equal in weight to three lines depth of mercury. From the barometer, however, we know that the whole pressure of the atmosphere is very different; sometimes being equal only to a column of 28 inches, and varying from thence to 31 inches. The whole quantity of pressure must thus be immense, and has been computed equal to a globe of lead 60 miles in diameter.

By means of its gravity, the atmosphere accomplishes many useful purposes in nature. It prevents the arterial vessels of animals and the sap-vessels of plants from being too much distended by the expansive power (whatever it is), which has a perpetual tendency to swell them out. Thus we see, that, in the operation of cupping, where the pressure of the air is taken off from a particular part, the expansive force instantly acts, and swells out the vessels to a great degree. Hence also, when animals are put into an air-pump, their whole bodies swell.

Of Air
in general.

8

Elasticity of
the air.

By its gravity, the air promotes the union of fluid bodies, which would instantly cease *in vacuo*. Thus oils and salts, which remain united in air, separate as soon as that fluid is extracted. Hence also, when hot water is put under an exhausted receiver, it boils violently; because the pressure of the air being now taken off, the particles of steam, which existed invisibly among the water, and which the gravity of the atmosphere prevented from flying off so soon, are now hurried up with great velocity, by means of the excessive comparative gravity of the aqueous fluid.

On the gravity of the air depend the ascent of water in pumps, syphons, &c. and likewise all the phenomena of the barometer.

Besides its gravity, which the air has in common with water and other fluids, there is another which it has only in common with steam or vapour. This is called its *elasticity*: by which, like a spring, it allows itself to be compressed into a smaller bulk, and then returns again to its original size upon removing the pressure.

The elasticity of the air was first ascertained by some experiments of lord Bacon, who, upon this principle, constructed the first thermometer, which he called his *vitrum calendare*. Of this power we have numerous proofs. Thus, a blown bladder being squeezed in the hand, we find the included air sensibly resist; so that, upon ceasing to compress, the cavities or impressions made in its surface are readily expanded again and filled up.

The structure and office of the *Air-Pump* depend on this elastic property. Every particle of air always exerts a *nisus* or endeavour to expand, and thus strives against an equal endeavour of the ambient particles; whose resistance happening by any means to be weakened, it immediately diffuses itself into an immense extent. Hence it is that thin glass bubbles, or bladders filled with air, and exactly closed, being included in the exhausted receiver of an air-pump, burst by the force of the air they contain; and a bladder almost quite flaccid, swells in the receiver and appears full. The same effect also takes place, though in a smaller degree, on carrying the flaccid bladder to the top of an high mountain.

9
Whether
this proper-
ty can be
diminished.

It has been questioned among philosophers, whether this elastic power of the air is capable of being destroyed or diminished. Mr Boyle made several experiments with a view to discover how long air would retain its spring after having assumed the greatest degree of expansion his air-pump would give it; but he was never able to observe any sensible diminution. Desaguliers found, that air, after having been inclosed for half a year in a wind-gun, had lost none of its elasticity; and Roberval, after preserving it in the same manner for 16 years, observed, that its expansive projectile force was the same as if it had been recently condensed. Nevertheless, Mr Hauksbee concludes, from a later experiment, that the spring of the air may be disturbed by a violent pressure, in such a manner as to require some time to return to its natural tone. Dr Hales inferred, from a number of experiments, that the elasticity of the air is capable of being impaired and diminished by a variety of causes.

The weight or pressure of the air has no dependence on its elasticity; but would be the same whether it had

such a property or not. The air, however, being elastic, is necessarily affected by the pressure, which reduces it into such a space, that the elasticity, which reacts against the compressing weight, is equal to that weight. In effect, the law of this elasticity is, that it increases as the density of the air increases; and the density increases as the force increases by which it is pressed. Now there must necessarily be a balance between the action and re-action; i. e. the gravity of the air which tends to compress it, and the elasticity by which it endeavours to expand, must be equal. Hence the elasticity increasing, or diminishing universally, as the density increases or diminishes, it is no matter whether the air be compressed and retained in such a space by the weight of the atmosphere, or by any other means; it must endeavour in either case to expand with the same force. And hence, if air near the earth be pent up in a vessel, and all communication with the external fluid cut off, the pressure of the inclosed air will be equal to the weight of the atmosphere at the time the quantity was confined. Accordingly, we find mercury sustained to the same height, by the elastic force of air inclosed in a glass vessel, as by the whole atmospherical pressure. On the same principle air may be artificially condensed; and hence the structure of the *Air-Gun*.

The utmost limits to which air, of the density which it possesses at the surface of the earth, is capable of being compressed, have not been ascertained. Mr Boyle made it 13 times more dense; Dr Halley says that he has seen it compressed so as to be 60 times denser than in its natural state, which is farther confirmed by M. Papin and M. Huygens. Dr Hales, by means of a press, condensed it 38 times; and by forcing water in an iron ball or globe, into 1551 times less space than it naturally occupies. However, Dr Halley has asserted, in the Philosophical Transactions, Abr. vol. ii. p. 17. that from the experiments made at London, and by the academy del Cimento at Florence, it might be safely concluded, that no force whatever is able to reduce air into 800 times less space than that which it naturally possesses on the surface of our earth. In answer to this, M. Amontons, in the Memoirs of the French Academy, maintains, that there is no fixing any bounds to its condensation; that greater and greater weights will still reduce it into less and less compass; that it is only elastic in virtue of the fire which it contains; and that as it is impossible ever to drive all the fire out of it, it is impossible ever to make the utmost condensation.

10
Utmost li-
mits of its
condensa-
tion and ex-
pansion.

The dilatation of the air, by virtue of its elastic force, is found to be very surprising; and yet Dr Wallis suggests, that we are far from knowing the utmost of which it is capable. In several experiments made by Mr Boyle, it dilated first into nine times its former space; then into 31 times; then into 60; then into 150. Afterwards it was brought to dilate into 8000 times its space, then into 10,000, and even at last into 13,679 times its space; and this altogether by its own expansive force, without the help of fire. On this depend the structure and use of the *MANOMETER*.

Hence it appears, that the air we breathe near the surface of the earth is compressed by its own weight into at least the 13,679th part of the space it would possess *in vacuo*. But if the same air be condensed by art,

Of Air
in general.

Of Air
in general.

11
Expansion
of the air
by heat.

art, the space it will take up when most dilated, to that it possesses when condensed, will be, according to the same author's experiments, as 550,000 to 1.

M. Amontons, and others, we have already observed, attribute the rarefaction of the air wholly to the fire contained in it; and therefore, by increasing the degree of heat, the degree of rarefaction may be carried still farther than its spontaneous dilatation. Air is expanded one-third of its bulk by boiling water.

Dr Hales found, that the air in a retort, when the bottom of the vessel was just beginning to be red-hot, was expanded through twice its former space; and in a white, or almost melting heat, it occupied thrice its former space; but Mr Robins found it was expanded by the heat of iron, just beginning to be white, to four times its former bulk. On this principle depend the structure and office of the THERMOMETER.

M. Amontons first discovered that air will expand in proportion to its density with the same degree of heat. On this foundation the ingenious author has a discourse, to prove "that the spring and weight of the air, with a moderate degree of warmth, may enable it to produce even earthquakes, and other of the most vehement commotions of nature." See the article EARTHQUAKE.

12
General ef-
fects of the
air's elasti-
city.

The elastic power of the air, then, is the second great source of the effects of this important fluid. Thus it insinuates into the pores of bodies; and, by possessing this prodigious faculty of expanding, which is so easily excited, it must necessarily put the particles of bodies into which it insinuates itself into perpetual oscillations. Indeed, the degree of heat, and the air's gravity and density, and consequently its elasticity and expansion, never remaining the same for the least space of time, there must be an incessant vibration or dilatation and contraction in all bodies.

We observe this reciprocation in several instances, particularly in plants, the air-vessels of which do the office of lungs; for the contained air alternately expanding and contracting, according to the increase or diminution of the heat, alternately presses the vessels and eases them again, thus keeping up a perpetual motion in their juices.

Hence we find, that no vegetation or germination will proceed *in vacuo*. Indeed, beans have been observed to grow a little tumid therein; and this has led some to attribute that to vegetation which was really owing to no other cause than the dilatation of the air within them. The air is very instrumental in the production and growth of vegetables, not only by invigorating their several juices while in an elastic active state, but also by greatly contributing in a fixed state to the union and firm connection of their several constituent parts.

From the same cause it is, that the air contained in bubbles of ice, by its continual action bursts the ice. Thus also, entire columns of marble sometimes cleave in the winter time, from the increased elasticity of some little bubble of air contained in them. From the same principle arise all putrefaction and fermentation; neither of which will proceed, even in the best disposed subjects, *in vacuo*.

Since we find such great quantities of elastic air generated in the solution of animal and vegetable substances, a good deal must constantly arise from the dis-

solution of these aliments in the stomach and bowels, which is much promoted by it; and, in reality, all natural corruption and alteration seem to depend on air.

§ 3. *Effects of the different Ingredients of Air.*— This fluid acts not only by its common properties of gravity and elasticity, but produces numerous other effects arising from the peculiar ingredients of which it consists.

Thus, 1. It not only dissolves and attenuates bodies by its pressure and attrition, but as a chaos containing all kinds of menstria, and consequently possessing powers for dissolving all bodies. It is known that iron and copper readily dissolve and become rusty in air, unless well defended with oil. Boerhaave assures us, that he has seen pillars of iron so reduced by air, that they might be crumbled to dust between the fingers; and as for copper, it is converted by the air into a substance much like the verdigrise produced by vinegar.

Mr Boyle relates, that in the southern English colonies the great guns rust so fast, that after lying in the air for a few years, large cakes of crocus martis may be separated from them. Acosta adds, that in Peru the air dissolves lead, and considerably increases its weight. Yet gold is generally esteemed indissoluble by air, being never found to contract rust, though exposed to it ever so long. In the laboratories of chemists, however, where aqua regia is prepared, the air becoming impregnated with a quantity of the vapour of this menstruum, gold contracts a rust like other bodies.

Stones also undergo the changes incident to metals. Thus Purbeck stone, of which Salisbury cathedral consists, is observed gradually to become softer, and to moulder away in the air; and Mr Boyle gives the same account of Blackington stone. He adds, that air may have a considerable operation on vitriol, even when a strong fire could act no farther upon it. And he has found, that the fumes of a corrosive liquor work more suddenly and manifestly on a certain metal when sustained in the air, than the menstruum itself did, which emitted fumes on those parts of the metal which it covered; referring to the effects of the effluvia of vinegar on copper.

The dissolving power of air is increased by heat, and by other causes. It combines with water; and by access of cold, deposits part of the matter which was kept dissolved in it by a greater degree of heat. Hence the water, by being deposited and condensed upon any cold body, such as glass, &c. in windows, forms fogs, and becomes visible.

In the various operations of chemistry, air is a very necessary and important agent; the result of particular processes depending on its presence or absence, on its being open or inclosed. Thus, the parts of animals and vegetables can only be calcined in open air; in close vessels they never become any other than black coals. And these operations are affected by the changes to which the air is liable. Many instances might be adduced to this purpose. Let it suffice to observe, that it is very difficult to procure oil of sulphur, *per campanam*, in a clear dry atmosphere; but in a thick moist air it may be obtained with greater ease, and in larger quantities. So, pure well-fermented wine, if it be carried to a place where the air is replenished with

13
Solvent
power of
the air on
metals.

14
On stones.

15
Various
chemical
effects of
the air.

Of Air
in general.

the fumes of new wine then fermenting, will begin to ferment afresh.

The changes in the air arise from various causes, and are observable, not only in its mechanical properties, such as gravity, density, &c. but in the ingredients that compose it. Thus, at Fashlun in Sweden, noted for copper-mines, the mineral exhalations affect the air in such a manner as to discolour the silver coin in purses; and the same effluvia change the colour of brads. In Carniola, Campania, &c. where are mines of sulphur, the air sometimes becomes very unwholesome, which occasions frequent epidemic diseases, &c.

The effluvia of animals also have their effect in varying the air; as is evident in contagious diseases, plagues, murrains, and other mortalities, which are spread by an infected air.

For the vivifying principle of air, see the article BLOOD.

SECT. II. *Historical Account of the principal Discoveries concerning the Composition of Atmospheric Air and other Aerial Fluids.*

16
Van Hel-
mont the
first disco-
verer of dif-
ferent kinds
of air.

WHILE the preceding discoveries were making concerning the mechanical and other properties of the air, little notice seems to have been taken of the elementary parts of the air itself, or the different kinds of fluid which go under that name. It was known, indeed, that air was separable from terrestrial bodies by means of fire, fermentation, &c. but this was commonly reckoned to be the same with what we breathe. Van Helmont, a disciple of Paracelsus, was the first who undertook to make inquiries concerning this species of air. He gave it the name of *gas sylvestre*, from the Dutch word *ghoast*, signifying spirit; and observes, that some bodies resolve themselves almost entirely into it. "Not (says he) that it had been actually contained in that form in the bodies from which it was separated; but it was contained under a concrete form, as if fixed, or coagulated." According to this author, the gas sylvestre is the same with what is separated from all substances by fermentation; from vegetables by the action of fire; from gun-powder when it explodes; and from charcoal when burning. On this occasion he asserts, that 62 pounds of charcoal contain 61 pounds of gas, and only one pound of earth. To the effluvia of gas he also attributes the fatal effects of the grotto del Cani in Italy, and the suffocation of workmen in mines. He asserts, that it is to the corruption of the aliment, and the gas discharged from it, that we are to attribute wind, and the discharges of it from the bowels. Upon the same principles he accounts for the swelling of dead bodies which have remained for a time under water, and for the tumours which arise on some parts of the body in certain diseases. He also determines, that this gas is different from the air we breathe; that it has a greater affinity with water: and he imagined it might consist of water reduced to vapours, or a very subtil acid combined with volatile alkali.

27
Discoveries
by Mr
Boyle.

Mr Boyle repeated all Van Helmont's experiments to more advantage than he himself had performed them; but seems not to have proceeded further in his discoveries than Van Helmont did: only he found some bodies, such as sulphur, amber, camphor, &c. diminish the volume of air in which they burn.

Dr Hales first attempted to determine the quantity of air produced from different bodies; for which purpose he made experiments on almost every known substance in nature, examining them by distillation, fermentation, combustion, combinations, &c. He also first suspected, that the briskness and sparkling of the waters, called *acidulous*, were owing to the air they contained. But notwithstanding all his discoveries concerning the quantity of elastic fluid obtained from different bodies, he did not imagine there was any essential difference between this fluid and the air we breathe; only that the former was loaded with noxious vapours, foreign to its nature. His suspicion concerning this impregnation was confirmed by M. Venel, professor of chemistry at Montpellier, in a memoir read before the Royal Academy of Sciences in 1750. This gentleman was able to disengage the air from the Seltzer waters, and to measure its quantity; which he constantly found to amount to about one-fifth of its bulk. The water thus deprived of its air became flat, and ceased to sparkle; the only difference then betwixt it and common water was, that the former contained a small quantity of sea-salt. Upon these principles he attempted to recompose Seltzer water, by dissolving in a pint of common water two drachms of fossil alkali, and then adding an equal quantity of marine acid. The quantity of sea-salt produced by the union of these two, he knew would prove equal to that contained in a pint of Seltzer water; and the effervescence produced by the action of the acid and alkali upon each other, he imagined would produce air sufficient for the impregnation of the water. In this he was not deceived: the water thus produced was not only analagous to Seltzer, but much more strongly impregnated with air.

Dr Black first discovered, that chalk, and the other earths reducible to quicklime by calcination, consist of an alkaline earth, by itself soluble in water, but which, combined with a large quantity of fixed air, becomes insoluble; losing the properties of quicklime, and assuming the natural appearance we observe those earths to have when not reduced into lime. The same thing he discovered in magnesia alba, and in alkalis both fixed and volatile. On the fixed air contained in these bodies, he found not only their property of effervescing with acids to depend, but likewise their mildness; both the alkalis and calcareous earth being highly caustic when deprived of their fixed air. He also found, that this fluid, which he called *fixed air*, had different degrees of affinity with different substances; that it was stronger with calcareous earth than with fixed alkali; with fixed alkali, than magnesia; and with magnesia, than volatile alkali. He also suspected, that the fixed air of alkaline salts unites itself with the precipitates of metals, when thrown down from acids; and that the increase of weight observable in these precipitates was owing to this cause. But he was of opinion, that the fluid which he called *fixed air* was very different from the common air we breathe; and therefore adopted the name of air, merely as one already established, whatever impropriety there might be in the term.

It was not long before the discovery of this species of air suggested new theories in physiology and natural philosophy. Mr Haller had inferred, from Dr Hales's experiments,

Of Air
in general.
18
By Dr Hales
19
Suspicion of
air in mine-
ral waters.

20
Confirmed
by Mr Ve-

21
Discoveries
by Dr Black,
&c.

Of Air
in general

experiments, that air is the real cement of bodies; which, fixing itself in the solids and fluids, unites them to each other, and serves as a bond by which they are kept from dissolution. In 1764, Dr Macbride of Dublin published a number of experiments in support of this doctrine. From his work it appears, that fixed air is separated, not only from all substances in fermentation, but also from all animal substances as they begin to putrefy; and that this air is capable of uniting itself to all calcareous earths, as well as alkalis both fixed and volatile, and restoring to them the property of effervescing with acids when they have by any means been deprived of it. But though these opinions have since been found erroneous, the conclusions drawn by him from his numerous experiments still hold good, viz. that fixed air is an elastic fluid, very different from the common air we breathe: that it is possessed of a strong antiseptic quality, and may be introduced with safety into the intestinal canal, and other parts of the animal œconomy, where common air would have fatal effects; but is mortal if breathed into the lungs, &c.

22
Quantity of
fixed air
contained
in alkaline
salts deter-
mined by
Mr Caven-
dish.

In 1766 and 1767, Mr Cavendish communicated some new experiments to the Royal Society at London, wherein he determines the quantity of air contained in fixed alkali, when fully saturated with it, to be five-twelfths of its weight, and seven-twelfths in volatile alkali: that water is capable of absorbing more than its own bulk of this air; that it has then an agreeable, spirituous, and acidulous taste; and that it has the property of dissolving calcareous earths and magnesia, as well as almost all the metals, especially iron and zinc: that the vapour of burning charcoal occasions a remarkable diminution of common air, at the same time that a considerable quantity of fixed air is produced in the operation. He also found, that solution of copper in spirit of salt, instead of producing inflammable air, like that of iron or zinc, afforded a species of air which lost its elasticity as soon as it came into contact with water.

23
Contest
concerning
the doctrine
of fixed air.

The discoveries of Dr Black concerning fixed air had not been long published, when they were violently attacked by some foreign chemists, while his cause was as eagerly espoused by others. The principal opponents were Mr Meyer apothecary at Osnabruck, Mr Crans physician to his Russian Majesty, and Mr de Smeth at Utrecht. Their arguments, however, were effectually answered at the time by Mr Jacquin, botanical professor at Vienna; and the numerous discoveries made since that time have given such additional confirmation to his doctrine, that it is now universally adopted by chemists both in Britain and other countries. It was reserved, however, for Dr Priestley to make the great discovery concerning the nature of our atmosphere; and to inform the world, that it is composed of two fluids; the one absolutely noxious, and incapable of supporting animal life for a moment; the other extremely salutary, and capable of preserving animals alive and healthy for a much longer time than the purest air we can meet with. This may be considered as the ultimate period of our history: for since that time the discoveries of philosophers still living, in many different countries, have been so rapid, that it is difficult to ascertain the dates of them by any authentic documents; especially as, by reason of such numerous experiments, the same things have not unfrequently

24
Composition of the
atmosphere
discovered.

been discovered by different persons unknown to each other. We shall therefore proceed to give an account of the different kinds of aerial fluids, beginning with those which are known, or supposed, to constitute a part of our atmosphere.

Dephlogis-
ticated Air.

SECT. III. Of Dephlogistified Air.

§ 1. *Discovery and Methods of procuring this Kind of Air.*—Dephlogistified air was first obtained by Dr Priestley on the 1st of August 1774. The circumstances which led him to the discovery, were his having always procured inflammable air from spirit of salt, by adding to it spirit of wine, oil of olives, oil of turpentine, charcoal, phosphorus, bees wax, and even sulphur. Hence he suspected, that the common air we breathe might be composed of some kind of acid united with phlogiston. On this supposition he extracted air from mercurius calcinatus *per se*, by exposing it to the focus of a burning-glass 12 inches in diameter; and, having repeated the experiment with red precipitate and minimum, he found, that though a quantity of fixed air was always produced, yet after that was separated, the remainder supported flame much more vigorously than common air; for a candle burned in it with a flame very much enlarged, and with a crackling noise, at the same time that it appeared fully as much diminished by the test of nitrous air. Whence he concluded, that it was respirable; and, on making the experiment, found that it actually was so, for a mouse lived a full half hour in a quantity of this fluid; which, had it been common air, would only have kept it alive half that time. Nor did the animal seem to be otherwise injured than by the cold; as it presently revived on bringing it near the fire, and the remainder of the air still appeared better than that of the atmosphere, when the test of nitrous air was applied to it.

25
Whence
first extract-

This pure kind of air being discovered, the Doctor next proceeded to name it *dephlogistified*, from his opinion that common air, in the act of burning, absorbed phlogiston; of consequence, he supposed, that which absorbed the most, or which most vigorously and for the greatest length of time supported flame, was supposed to contain the smallest quantity of this substance. In the course of his inquiries why this kind of air comes to be so much dephlogistified, he fell upon a method of extracting it from a great variety of substances; viz. by moistening them with spirit of nitre, and then distilling them with a strong heat. Thus he obtained it from flowers of zinc, chalk, quicklime, slacked lime, tobacco-pipe clay, flint, Muscovy tales, and even glass. He then found, that by simply dissolving any metal in the nitrous acid, and then distilling the solution, he could obtain very pure air: and Mr Warltire found even the trouble of distillation unnecessary; nothing more being requisite than to moisten red lead with the spirit of nitre, and then pour upon it the oil of vitriol, which instantly disengaged the dephlogistified air without applying any more heat than what was generated by the mixture.

26
Whence named
dephlogisti-
ficated.

27
Produced
from a great
variety of
substances.

While discoveries of this kind engaged Dr Priestley in England, Mr Scheele was employed in a similar manner in Sweden; and had actually obtained the same kind of air, without knowing any thing of what Dr Priestley had done. The latter had the merit of the prior

28
This kind
of air dis-
covered also
by Mr
Scheele.

Dephlogi-
ficated Air.

prior discovery: but Mr Scheele's method was more simple, consisting only in the distillation of nitre with a strong heat; by which means it is now found that dephlogisticated air may be obtained in very considerable quantity, and in as great purity, as by the more expensive processes. The pure air from nitre had indeed partly been obtained by Dr Hales long before this time; since he informs us, that half a cubic inch of nitre yielded 90 cubic inches of air, which was undoubtedly the fluid we speak of; but as he neglected to prosecute the discovery, nothing farther was known at that time.

29
May be
produced
without ni-
trous acid.

As the nitrous acid was universally concerned in the first processes for obtaining this kind of air, it was for some time generally believed to be a peculiar property of that acid alone to produce it; but the indefatigable genius of Dr Priestley soon found, that it might not only be procured where no nitrous acid was employed, but where the substances were treated with vitriolic acid. It was indeed evident, from the very first experiment, that nitrous acid was not essentially necessary; since pure air was procured from precipitate *per se*, in the preparation of which no nitrous acid is employed. The Abbé Fontana found, that 192 grains of this substance yielded $26\frac{1}{2}$ cubic inches of dephlogisticated air, at the same time that the weight of it was reduced to $178\frac{8}{9}$ grains, which is nearly the weight of that quantity of air. It had formerly been observed, that the weight of mercury is augmented during its conversion into precipitate *per se*, as that of lead is by its conversion into minium. The experiments just now mentioned, therefore, show, that during this process the air is decomposed; the pure dephlogisticated part of it being absorbed by the metal, and appearing again on the application of heat; and the same appears to be the case with red lead, from the experiment of Mr Warltire already mentioned. With regard to this last substance, however, a very great singularity is observed; viz. that when newly prepared it yields none at all, and even for some time after the produce is much smaller than when it has been long kept. The reason of this seems to be, that the minium still contains a considerable quantity of phlogiston, which flies off into the atmosphere by long keeping, a larger quantity of the dephlogisticated part of the atmosphere being imbibed at the same time. The mode of applying heat has also a very considerable effect on the quantity of air produced. Thus, Dr Priestley remarks*, that "from equal quantities of red lead, without any mixture of spirit of nitre, and using the same apparatus for distilling it, he obtained, by means of heat applied suddenly, more air than when slowly applied, in the proportion of ten to six. The proportion of fixed air was the same in both cases, and the remainder equally dephlogisticated."

* Exper.
and Observ.
iii. 37.30
Produced
in greatest
quantities
by a quick
and violent
heat.31
Method of
extracting
it from va-
rious sub-
stances.

By heat alone, the Doctor found, that sedative salt, manganese, lapis calaminaris, and the mineral called *lapis ponderosus*, *wolfram*, or *tungsten*, would yield dephlogisticated air; the first indeed in very small quantity, and sometimes even of a quality very little superior to common air. In these experiments, he made use of small-bellied retorts of green glass, which can stand the fire best, containing about an ounce of water, and having narrow necks 18 or 20 inches long. The substance to be examined was put into a retort of this

kind, and then exposed to a red heat, either in sand or over a naked fire, while the neck of the vessel was plunged in water or mercury.

Dephlogi-
ficated Air.

Having dissolved six pennyweights of very clean iron in oil of vitriol, and then distilled the solution to dryness in a long-necked retort, he received the common air a little phlogisticated, some fixed air, much vitriolic acid air, and lastly 18 ounce-measures of dephlogisticated air. The iron that remained undissolved weighed 23 grains, so that the air was yielded by five pennyweights one grain of iron. The ochre weighed seven pennyweights thirteen grains: so that, says he, there probably remained a quantity of oil of vitriol in it; and consequently, had the heat been greater, more air would have been obtained.

In his experiments with the nitrous acid, as it had constantly been found, that by pouring on more nitrous acid on the residuum, and repeating the operation, more dephlogisticated air might be obtained, the Doctor determined to try whether the same would not hold good with vitriolic acid also. For this purpose, he added more oil of vitriol to the residuum of the last-mentioned experiment. When in a red heat with a glass retort, it yielded a quantity of vitriolic acid air, no fixed air, but about 24 ounce-measures of dephlogisticated air; when, the retort being melted, a good deal of the air was necessarily lost; but, on resuming the process in a gun-barrel, he procured as much air as had been got before.—Pursuing these experiments, he obtained with common crust of iron and oil of vitriol, dephlogisticated air at the first distillation, and a great deal more from the residuum, by pouring fresh oil of vitriol upon it. The same product he obtained from blue vitriol, solution of copper in the vitriolic acid, and from a solution of mercury in that acid. On this substance he remarks, that "either by means of oil of vitriol or spirit of nitre, it yields a great quantity of dephlogisticated air: but with this difference, that in the process with spirit of nitre, almost the whole of the mercury is revived (not more than a twentieth part being lost, if the process be conducted with care); but in that with vitriolic acid, almost the whole is lost." From the later experiments of Mr Lavoisier, however, it appears that the Doctor's process had not been conducted with sufficient care; as from two ounces of the dry salt formed by a combination of vitriolic acid with mercury, the former obtained 6 drachms 12 grains of running mercury, besides 3 drachms 58 grains of mercurial sublimate of two different colours. Dephlogisticated air was likewise obtained from pure calx of tin, or putty, mixed with oil of vitriol; but none in any trial with the marine acid, excepting when it was mixed with minium; in which case the air obtained was probably that which the minium would have yielded without any addition.

The result of all these, and innumerable other experiments made by philosophers in different countries, was, that dephlogisticated air may be obtained from a vast variety of mineral and metallic substances by means of the vitriolic and nitrous acids. It now remained only to discover in what manner this fluid, so essentially necessary to the support of animal life, is naturally produced in quantities sufficient for the great expence of it throughout the whole world, by the breathing of animals, the support of fires, &c. This discovery, indeed,

32
How de-
phlogisti-
cated air is
naturally
produced.

Dephlogi-
ficated air.

deed, had been made before even the existence of dephlogisticated air itself was known, Dr Priestley, after having tried various methods of purifying contaminated air unsuccessfully, found at last, that some kinds of vegetables answered this purpose very effectually; for which discovery he received the thanks of the Royal Society. Among the vegetables employed on this occasion, he found mint answer the purpose very effectually. "When air," says he*, "has been freshly and strongly tainted with putrefaction, so as to smell through the water, sprigs of mint have presently died upon being put into it, their leaves turning black; but if they do not die presently, they thrive in a most surprising manner. In no other circumstances have I seen vegetation so vigorous as in this kind of air, which is immediately fatal to animal life. Though these plants have been crowded in jars filled with this kind of air, every leaf has been full of life; fresh shoots have branched out in various directions, and grown much faster than other similar plants growing in the same exposure in common air."—Having in consequence of this observation rendered a quantity of air thoroughly noxious, by mice breathing and dying in it, he divided it into two receivers inverted in water, introducing a sprig of mint into one of them, and keeping the other receiver unaltered. About eight or nine days after, he found that the air of the receiver into which he had introduced the sprig had become respirable; for a mouse lived very well in this, whereas it died the moment it was put into the other.

33
Noxious air improved by vegeta-
ting mint.

34
Experiments seem-
ingly con-
tradictory.

* Exper. and Observ. iv. 302,
says Dr Priestley*, "I still think it probable, that the vegetation of healthy plants, growing in situations natural to them, have a salutary effect on the air in which they grow.—For one instance of the melioration of air in these circumstances should weigh against an hundred in which the air is made worse by it, both on account of the disadvantages under which all plants labour, in the circumstances in which these experiments must be made, as well as the great attention and many precautions that are requisite in conducting such a process."

35
Experiments of
Dr Ingen-
housz on the
melioration
of air by
vegetation.

At the time that Dr Priestley made these experiments, he supposed that the air was meliorated merely by the absorption of phlogiston from that which had been tainted; but the experiments of Dr Ingenhousz, made in 1779, showed that this was accomplished, not

only by the absorption just mentioned, but by the emission of dephlogisticated air. He observed in general, that plants have a power of correcting bad air, and even of improving common air in a few hours, when exposed to the light of the sun; but, in the night-time, or when they are not influenced by the solar rays, they contaminate the air. This property, however, does not belong in an equal degree to all kinds of plants: nor is it possible to discover by the external properties of a plant, whether it be fit for this purpose or not; as some which have a bad smell, and are entirely unfit for food, show themselves much superior to others whose external appearance would seem preferable. His method of making the experiment was, to fill a vial with air, fouled either by respiration or combustion; after which a sprig of any plant was introduced, by passing it through the water in which the vial was immersed. The vial was then stopped; or it was removed into a small basin full of water, and exposed to the sun, or situated in some other proper place, as occasion required. Air phlogisticated by breathing, and in which a candle could not burn, after being exposed to the sun for three hours, with a sprig of peppermint in it, was so far corrected, as to be again capable of supporting flame. The following experiment, however, made with a mustard plant, may be looked upon as decisive: A plant of this kind was put into a glass receiver containing common air, and its stem cut off even with the mouth of the receiver. The vessel was then inverted in an earthen pan, containing some water to keep the plant alive, and the whole apparatus was set over-night in a room. Next morning the air was found so much contaminated, that it extinguished the flame of a wax taper. On exposing the apparatus to the sun for a quarter of an hour, the air was found to be somewhat corrected: and after an hour and an half it was so far improved, that by the test of nitrous air it appeared considerably better than common air.

Before we proceed farther in the account of Dr Ingenhousz's experiments, it will be necessary to relate some observations made by Dr Priestley; from which it appears, that dephlogisticated air, in very considerable quantity, may, in certain circumstances, be produced from water alone. The substance of these is, that water, especially pump-water, when exposed to the light of the sun, emits air slowly: but after some time a green matter appears on the bottom and sides of the glass; after which it emits very pure air in great quantity, and continues to do so for a very long time, even after the green matter has shown some symptoms of decay by becoming yellow. He observed, that the water which naturally contained the greatest quantity of fixed air, yielded also the greatest quantity of that which was dephlogisticated; but that the quantity of the latter much exceeded that of the fixed air contained even in any water. The light of the sun was found to be an essential requisite in the formation of this air, as very little, and that of a much worse quality, was produced in the dark.

As the green matter produced in Dr Priestley's glasses, was by himself, as well as others, considered as belonging to the vegetable kingdom, Dr Ingenhousz improved upon his process, by putting the leaves of plants into water, and exposing them to the sun. All plants were not equally fit for producing dephlogisticated air.

Dephlogi-
ficated Air.

36
Dephlo-
gified
air produ-
ced from
water.

37
From the
leaves of
plants.

Dephlogi-
ficated Air.

by this method more than by the other. Some poisonous plants, as the hyoscyamus, lauro-cerasus, night-shade, the tobacco-plant, a triplex vulvaria, cicuta aquatica, and fabina, were found very fit for the purpose; but the purest kind of air was extracted from some aquatic vegetables, the turpentine-trees, and especially from the green matter he collected in a stone trough which was kept continually filled with water from a spring near the high-road. The purity of this dephlogisticated air, he says, was equal, if not superior, to that procured by the best chemical processes; as it sometimes required eight times its own quantity of nitrous air to saturate it. All parts of the plants were not found equally proper for the production of dephlogisticated air; the full grown leaves yielded it in greatest quantity and purity, especially from their under surface. It was also procured from the green stalks.—One hundred leaves of *Nasturtium Indicum*, put into a jar holding a gallon, filled with ordinary pump-water, and exposed to the sun from 10 to 12 o'clock, yielded as much air as filled a cylindrical jar four inches and an half in length, and one and three quarters in breadth. On removing this quantity of air, and exposing them again to the sun till seven o'clock, about half as much was produced, of a quality still superior to the former; and next morning by eleven o'clock, they yielded as much more of an equal quality. The roots of plants, he says, when kept out of ground, generally yield bad air, and at all times contaminate common air, a few only excepted. Flowers and fruits, in general, yield a very small quantity of noxious air, and contaminate a great quantity of common air at all times, especially in the night, and when kept in the dark. Two dozen of young and small French beans, kept in a quart-jar of common air for a single night, contaminated the air to such a degree, that a very lively chicken died by being confined in it less than half a minute.

38
Conclusions
from Dr
Ingen-
housz's ex-
periments.

The observations of Dr Ingenhousz on the whole, says Mr Cavallo, clearly show, "that the vegetation of plants is one of the great means employed by nature to purify the atmosphere, so as to counteract, in great measure, the damage done by animal respiration, combustion, &c. It may only be said, that vegetation does not appear to be sufficient to remedy entirely that damage." The Doctor himself, however, speaks very highly of the powers of vegetables in this respect. He informs us, that their office in yielding dephlogisticated air begins a few hours after the sun has made his appearance in the horizon, or rather after it has passed the meridian, and ceases with the close of day; excepting some plants which continue it a short time after sunset: The quantity of dephlogisticated air, yielded by plants in general, is greater in a clear day than when it is somewhat cloudy. It is also greater when the plants are more exposed to the sun, than when they are situated in shady places. He observes, moreover, that the damage done by plants in the night, is more than counterbalanced by the benefit they afford in the day-time. "By a rough calculation (says he), I found the poisonous air, yielded by any plant during the whole night, could not amount to one hundredth part of the dephlogisticated air which the same plant yielded in two hours time in a fair day."—It does not appear, however, that plants yield dephlogisticated air by any kind of generation of that fluid, but only by filtrating the common

Nº 4.

air, which all plants absorb through their pores; the phlogistic part becoming part of their substance, and probably being the true vegetable food, as is explained more at large under the article AGRICULTURE.—Dry plants have little or no effect upon the air until they are moistened.—On all these experiments, however, it must be observed, that they have sometimes failed in the hands of those whom we cannot but suppose very capable of trying them; as Mr Scheele, Mr Cavallo, and the Abbé Fontana.

After the publication of Dr Ingenhousz's experiments, it became generally believed, that the atmosphere was meliorated by the common process of vegetation, and that plants absorbed the phlogistic part as their food, discharging the pure dephlogisticated air as an excrement; which is just the reverse of what happens to animals, who absorb the pure part in respiration, and reject the phlogistic. In the Philosophical Transactions for 1787, however, we find a number of experiments related by Sir Benjamin Thompson, which seem to render this matter dubious.—One very considerable objection is, that the green matter, already mentioned in Dr Priestley's experiments, when carefully observed by a good microscope, appears not to be of a vegetable, but of an animal nature. The colouring matter of the water, says he, is evidently of an animal nature; being nothing more than the assemblage of an infinite number of very small, active, oval-formed animalcules, without any thing resembling *tremella*, or that kind of green matter or water-moss which forms upon the bottom and sides of the vessel when this water is suffered to remain on it for a considerable time, and into which Dr Ingenhousz supposes the animalcules above mentioned to be actually transformed.

This gentleman has also found, that several animal substances, as well as vegetables, have a power of separating dephlogisticated air from water when exposed to the light of the sun, and that for a very great length of time. Not that the same quantity of water will always continue to furnish air; but the same animal substance being taken out, washed, and again put into fresh water, seems to yield dephlogisticated air, without any kind of limitation.

Raw silk possesses a remarkable power of this kind. To determine it, Sir Benjamin introduced 30 grains of this substance, previously washed in water, into a thin glass globe $4\frac{1}{2}$ inches in diameter, having a cylindrical neck $\frac{1}{4}$ ths of an inch wide, and twelve inches long, inverting the globe into a jar filled with the same kind of water, and exposing it to the action of the sun in the window. It had not been ten minutes in this situation, when the silk became covered with an infinite number of air-bubbles, gradually increasing in size, till, at the end of two hours, the silk was buoyed up, by their means, to the top of the water. By degrees they began to separate themselves, and form a collection of air in the upper part of the globe; which, when examined by the test of nitrous air, appeared to be very pure. In three days he had collected $3\frac{1}{4}$ cubic inches of air; into which a wax-taper being introduced, that had just before been blown out, the wick only remaining red, it instantly took fire, and burned with a bright and enlarged flame. The water in the globe appeared to have lost something of its transparency, and had changed its colour to a very faint greenish cast, having

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39
Sir Benjamin
Thompson's ex-
periments.

40
Green mat-
ter obser-
ved by Dr
Priestley,
said to be of
an animal
nature.

41
Dephlo-
gisticated
air produ-
ced by raw
silk.

Dephlogi-
ficated Air.Dephlogi-
ficated Air.

at the same time acquired the smell of raw silk.—This was several times repeated with fresh water, retaining the same silk, and always with a similar result; but with this difference, that when the sun shone very bright, the quantity of air produced was not only greater, but its quality superior to that yielded when the sun's rays were feeble, or when they were frequently intercepted by flying clouds. "The air, however, (says he), was always not only much better than common air, but even than that produced by the fresh leaves of plants exposed in water to the sun's rays in the experiments of Dr Ingenhoufz; and, under the most favourable circumstances, it was so good, that one measure of it required four of nitrous air to saturate it, and the whole five measures were reduced to 1.35."

42
No air pro-
duced in the
dark.

An experiment was next made in order to determine the effect of darkness upon the production of air: and in this case only a few inconsiderable bubbles were formed, which remained attached to the silk; nor was the case altered by removing the globe into a German stove. Some single bubbles, indeed, had detached themselves from the silk and ascended to the top, but the air was in too little quantity to be measured or proved.—The medium heat of the globe, when exposed to the sun's rays, was about 90° of Fahrenheit, though sometimes it would rise as high as 96; but air was frequently produced, when the heat did not exceed 65 and 70°.—On reversing this experiment, in order to try the effect of light without heat, it was found, that by plunging the globe into a mixture of ice and water, which brought it to the temperature of about 50° of Fahrenheit, the produce of air was diminished, though it still continued in considerable quantity.

43
Effects of
light with-
out heat.44
Of artificial
light.

The effect of artificial light, instead of that of the sun, was next tried. For this purpose all the air was removed from the globe; and its place being supplied with a quantity of fresh water, so as to render it quite full, it was again inverted in the jar, and removed into a dark room surrounded with six lamps and reflectors; six wax candles were also placed at different distances from three to six inches from it, and disposed in such a manner as to throw the greatest quantity of light possible upon the silk, taking care at the same time that the water should not acquire a greater heat than 90°. In this situation the silk began to be covered with air-bubbles in about ten minutes; and in six hours as much was collected as could be proved by nitrous air, when it was found to be very pure. A fresh-gathered, healthy leaf of a peach-tree, and a stem of the pea-plant with three leaves upon it, furnished air by exposure to the same light, but in smaller quantities than by the action of the solar rays. The air produced in the dark, in whatever manner procured, was always in too small quantity to be measured.

In making these experiments, as it was found somewhat troublesome to invert the globes in water, they were at last only kept in an inclined posture on the table, as represented in Plate VIII. fig. 1. the air collecting itself in the upper part of the belly. Having provided himself with a number of globes of different sizes, he then proceeded in his experiments in the following manner:

45
Various
substances
substituted
for raw silk.

Finding that raw silk, exposed to the action of light, produced so great a quantity of air, he was induced to try whether some other substances might not be found out capable of doing the same. Having therefore

Vol. I. Part. I.

provided six globes of $4\frac{1}{2}$ inches in diameter, and filled them with spring water, he introduced into each of them 15 grains of one of the following substances, viz. sheep's wool, eider-down, fur of a Russian hare, cotton wool, lint or the ravelings of linen yarn, and human hair.—The results of these experiments were, 1. The globe containing the sheep's wool began to yield air in three days; but several days of cloudy weather intervening, he did not remove it for some time, when only $1\frac{1}{4}$ ths of an inch of air was collected, which proved very pure when tried with nitrous air; but the wool, even in the most favourable circumstances, never afforded more than one third of the quantity which would have been yielded by silk. 2. The water with the eider-down began to furnish air almost immediately, and continued to do so in quantities little less than had been furnished by the silk, and nearly of the same quality. One cubic inch and three quarters of this air, furnished the eighth day from the beginning of the experiment, with three measures of nitrous air, was reduced to 1.34. 3. The fur of the hare produced more air than the wool, but less than the eider-down. Two cubic inches of air were collected in four days; which made its appearance in a different manner from that of the other substances, the air-bubbles being at considerable distances from one another, and growing to an uncommon size before they detached themselves from the fur. The cotton yielded a considerable quantity of air of a better quality than any of the former. The ravelings of linen were very slow in furnishing air, and produced but a small quantity; only two cubic inches being collected in the space of a fortnight. This substance appeared to be the very reverse of the hare's fur; for the air, instead of attaching and collecting itself about the substance in large bubbles, scarce ever made its appearance in sufficient quantity to raise it to the top of the water. The human hair furnished still less than the linen, and the produce was of inferior quality, though still superior to the common atmosphere.

In order to discover the comparative fineness of air produced from vegetables and from raw-silk, a small quantity of air from the stem of a pea-plant, which had four healthy leaves upon it, was proved with nitrous air, and found greatly inferior to that from raw-silk and several of the substances already mentioned. An entire plant of housewort, of a moderate size, furnished only $\frac{1}{4}$ ths of a cubic inch of air in seven hours, and that greatly inferior to common air; but the leaves alone afforded a much greater quantity, and of a quality greatly superior.

Having proceeded thus far, it was next determined to ascertain how much air a given quantity of water would yield by exposure to the sun's rays. For this purpose, a globe of fine white, clear, and very thin glass, containing 296 inches, being filled with fresh spring water, and 30 grains of raw silk immersed in it, was exposed to the air for three days in the month of May, but for the most part cold and cloudy. During this time only $9\frac{1}{4}$ inches of air were produced; but next day, by exposure to the sun from nine in the morning till five in the afternoon, the weather being very fine, 8.46 inches more were produced. The water had now assumed a light greenish colour. Next day, the product of air was nine cubic inches, of a better quality; and the day following, six inches still

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superior,

Dephlogis-
ticated Air.

superior, though exposed only for three hours and an half; but the next day it being cold and cloudy, only $\frac{1}{4}$ ths of an inch of air were produced, and these manifestly inferior to the foregoing. No more air could afterwards be procured, excepting one quarter of a cubic inch; so that from 296 inches of this water, 33.96 of air were obtained.

In this experiment the air produced was every day removed from the globe, and its place supplied with water: the following were made, to determine what alteration would take place on allowing the quantity of air produced to remain from first to last. The globe being therefore filled again, and the silk well washed and replaced in it, the quantity of air produced amounted in four days to 30.1 cubic inches; and would probably have been more considerable, had not the globe been unable to contain it along with the water, and therefore there was a necessity for putting an end to the experiment. The quality was superior to the former.—In this experiment the water had lost its transparency, and acquired a greenish cast; a quantity of yellowish earth was precipitated to the bottom, and attached itself so strongly to the glass, that it could not be removed without great difficulty.

On varying the experiment, by employing unwashed raw silk, it was found, that 17 grains of it in 20 cubic inches of water, produced, for the first four days, air of a worse quality than the atmosphere; but afterwards yielded near two inches of a superior quality. The quantity of this air was superior to that in other experiments, though its quality was somewhat inferior.

In reflecting on the experiments above related, it occurred to Sir Benjamin, that the cotton-like substance produced by the *populus nigra*, a species of poplar tree, might be a proper substitute for the raw silk; especially as he recollected, that on rendering it very dry for some other purpose, some parcels of it had quitted the plate on which they were laid, and mounted up to the top of the room. An hundred and twenty grains of this substance were therefore put into the large globe containing 296 inches; but after exposure to the sun for some hours, the air produced, in quantity about $1\frac{1}{4}$ ths of a cubic inch, was found to be little better than phlogistified air. In three days after, only one cubic inch was formed; and this appeared to be completely phlogistified. Next day, only a few inconsiderable air-bubbles appeared; but, the day following, the water suddenly changed to a greenish colour, and began all at once to give good air, and in great abundance. This day 10.42 cubic inches were produced, and the next 14.34. The same water continued to furnish air for four days longer; the whole quantity amounting to $44\frac{1}{2}$ cubic inches, the quality of which was superior to that of the air produced in former experiments.

47
Of the cause
of this pro-
duction of
air.

In speculating on the cause of this production of air, it occurred to our author, that perhaps the quantity of it might be in proportion to the surfaces of both. In order to ascertain this, he viewed an hair of silk, and another of poplar-cotton, through a good microscope, when the former appeared twice the diameter of the latter. The specific gravity of the cotton was found

to be nearly equivalent to that of water; and, by a comparative view of the two through a microscope, the surfaces appeared to be as 1000 to 3468. By proceeding in this calculation, it appeared that the surface of 30 grains of the cotton could not be less than 6600 square inches, while that of a like quantity of the silk amounted to no more than 476. Hence it evidently appeared, that the produce of air from the two substances was neither in proportion to their weights nor their surfaces. It appeared also, that the quality of the air produced at first was considerably inferior to that yielded some time afterwards. In order to ascertain the times at which air of the best quality was produced, &c. the following experiments were made: 1. A globe, containing 46 cubic inches, being filled with water, and 30 grains of raw silk, well washed, and freed from the remains of former experiments, put into it, yielded in a cold and cloudy day only $\frac{1}{4}$ th of a cubic inch of air: the two following days it yielded $3\frac{1}{2}$ cubic inches, the quality of which was superior to that of the former in the proportion of 296 to 114 (A). 2. The globe being filled again with water, in two other days when the sunshine was less powerful, the quality was 197, and the quantity $1\frac{1}{8}$ th; but afterwards, when the weather became fine, the quantity was again 3.8 inches, and quality 342. 3. The globe being again filled with water, and exposed to the sun for two days, yielded 2.2 inches of air, of a quality equal to 233. 4. A similar globe, with poplar-cotton which had been used in former experiments, gave 2.53 inches, of a quality 280. 5. A small globe of 20 inches, with 17 grains of raw silk, gave one cubic inch of air, of the quality 263. 6. A large globe of 296 inches, filled with fresh water, and a small quantity of *conserva rivularis*, gave $1\frac{1}{2}$ cubic inch, of the quality only of 124. The water was changed to a brown colour. 7. On repeating the experiment with a small handful of the conserva, 13.14 cubic inches of air were produced, of the quality 246. The water was very faintly tinged, towards the end of the experiment, of a greenish cast. 8. The globe of 46 inches, with 30 grains of raw-silk used in many former experiments, produced in two days 1.6 cubic inches of air, of the quality 204. 9. A globe of equal capacity, with 15 grains of poplar-cotton, produced in the same time 1.28 inches, of the quality 260. In both these experiments the water had acquired a faint greenish cast; but the colour of that with the cotton was deepest. On examining this water with a microscope, it was found to contain a great number of animalcules exceedingly small, and nearly of an oval figure; that with the silk contained them likewise, but not in such numbers: however, our author assures us, that in all cases in which the water acquired a greenish hue, he never failed to find them; and thinks, that from their presence alone, the colour of the water in the first instance universally arose.

As Sir Benjamin was now more than ever embarrassed with respect to the share the silk and other bodies employed in these experiments had in producing the air, he made the following experiment to determine the matter: "Concluding (says he), that if silk and other bodies,

48
At what
times air of
the best
quality is
produced.49
Experiment
with spun
glass.

(A) In all these experiments, the quality of atmospheric air is supposed to be 100.

Dephlogi-
ficated Air. bodies, used in the foregoing experiments, actually did not contribute any thing, considered as chemical substances, in the process of the production of pure air yielded by water; but if, on the contrary, they acted merely as a mechanical aid in its *separation* from the water by affording a convenient surface for the air to attach itself to; in this case, any other body having a large surface, and attracting air in water, might be made use of instead of the silk in the experiment, and pure air would be furnished, though the body should be totally incapable of communicating any thing whatever to the water."

With a view to ascertain this, the large globe being made perfectly clean, and filled with spring-water, he introduced into it a quantity of the fine thread of glass commonly called *spun-glass*, such as is used for making a brush for cleaning jewels, and an artificial feather sold by Jew pedlars. The result of the experiment was, that the globe being exposed in the sun, air bubbles began almost instantly to make their appearance on the surface, and in four hours 0.77 of a cubic inch of air was procured, which, with nitrous air, showed a quality of 88; after which, not a single globule more was produced, though the globe was exposed for a whole week in fine sunshine weather. Hence it appears that something more than mere surface was wanted to produce dephlogisticated air from water by means of the sun's light.

50
Of the quantity and quality of air produced from water alone. The following experiments were made with a view to determine the quantity and quality of air produced by means of the heat and light of the sun from water alone. A large jar of clear glass, containing 455 cubic inches, being washed very clean, was filled with fresh spring water, inverted in a glass basin of the same, and exposed to the weather for 28 days. At the same time, another similar jar was filled with water taken from a pond in a garden in which many aquatic plants were growing, and exposed in the same place, and during the same period. The latter began to yield air in pretty large quantities on the third day, and continued to do so till the 14th; the former yielded little or none till the 14th, when it began to emit air, and continued to do so till the 22d. On removing the air produced, that from the spring water was 14 inches in quantity, and 138 in quality; but from the pond water, 31½ in quantity, and 252 in quality. The colour of the waters was not changed; but both of them had deposited a considerable quantity of earth, which was found adhering to the surfaces of the glass basins in which the jars were inverted. As these basins, however, were very thick, and consequently had but little transparency, the sediment of the water was in a great measure deprived of the benefit of the sun's light; the experiment was therefore repeated with the following variation: In a large cylindrical jar of very fine transparent glass, 10 inches in diameter and 12 inches high, filled with spring-water, a conical jar, 9½ inches in diameter at the bottom, and containing 344 inches, was inverted, and the whole exposed to the sun for 21 days. Little air was furnished till the 7th day, when the liquor assumed a greenish cast, and a fine slimy sediment of the same colour, the green matter of Dr Priestley, beginning to be formed on the bottom, air was generated in abundance, and was furnished in pretty large quantities till the 18th, when it entirely

ceased. The whole amounted to 40 cubic inches, and the quality 213.

These are the principal experiments contained in Sir Benjamin Thompson's letter to Sir Joseph Banks. In his postscript he observes, that as he never was thoroughly satisfied with the opinion of Dr Ingenhousz, that the dephlogisticated air was *elaborated* in the vessels of the plant, he found his doubts rather confirmed than diminished by the experiments above related. "That the fresh leaves of certain vegetables (says he), exposed in water to the action of the sun's rays, cause a certain quantity of pure air to be produced, is a fact which has been put beyond all doubt: but it does not appear to me by any means so clearly proved, that this air is '*elaborated* in the plant by the powers of vegetation,—phlogisticated or fixed air being received by the plant as food, and the dephlogisticated air rejected as an excrement:' for besides that many other substances, and in which no elaboration or circulation can possibly be supposed to take place, cause the water in which they are exposed to the action of the light to yield dephlogisticated air as well as plants, and even in much greater quantities, and of a more eminent quality; the circumstances of the leaves of a vegetable, which, accustomed to grow in air, are separated from its stem and confined in water, are so unnatural, that I cannot conceive that they can perform the same functions in such different situations.

"Among many facts which have been brought in support of the received opinion of the elaboration of air in the vessels of plants, there is one upon which great stress is laid, which, I think, requires further examination. The fresh healthy leaves of vegetables, separated from the plant, and exposed in water to the action of the sun's rays, appear, by all the experiments which have hitherto been made, to furnish air only for a short time. After a day or two, the leaves, changing colour, cease to yield air. This has been conceived to arise from the powers of vegetation being destroyed, or, in other words, the death of the plant: and from hence it has been inferred, with some degree of plausibility, not only that the leaves actually retained their vegetative powers for some time after they were separated from their stock; but that it was in consequence of the exertion of those powers, that the air yielded in the experiment was produced.

52
"But I have found, that though the leaves, exposed in water to the action of light, actually do cease to furnish air after a certain time, yet that they *regain* this power after a short interval, when they furnish (or rather cause the water to furnish) more and better air than at first; which can hardly be accounted for upon the supposition that the air is elaborated in the vessels of the plant."

In confirmation of this doctrine, the globe of 46 inches was filled with fresh spring-water, and two peach-leaves were exposed for 10 days to the sun. In four days the water seemed to be entirely exhausted: but, next day, the water acquired a greenish colour, and again produced air pretty plentifully, which appeared in bubbles on the leaves; and on the 6th day, 0.34 of a cubic inch of air was produced, of the quality 232. Next day it yielded ⅞ths of a cubic inch, of the quality 297. The three succeeding days it yielded 1½ inches, the quality 307; after which an end was put to the experiment.—

Dephlogi-
ficated Air.

riment.—On making other trials with leaves immersed in water already green and prepared to yield dephlogi-
ficated air, it was found that they produced air in great quantity: but our author is of opinion, that all the appearances may be solved, by supposing that the air was produced in the mass of water by the green matter; and that the leaves, silk, &c. did no more than assist it in making its escape, by affording a convenient surface to which it could attach itself, in order to collect together and assume its elastic form.

53
Pure air
found in
sea-water.54
How to
procure
pure air in
large quan-
tity.55
Dephlogi-
ficated air
produces
intense heat.56
Explodes
violently
with in-
flammable
air.

Thus we see, that nature is provided with abundant resources for the supplying of this pure part of the atmosphere which is subject to such continual waste; and there is not the least doubt, that in a great number of cases the light of the sun produces pure air from water as well as from vegetables. It is probable, also, that even the waters of the ocean contribute towards this salutary purpose; as Dr Dobson of Liverpool found, that sea-water contained air superior in quality to that of the atmosphere. The purification of atmospheric air by agitating it in water, will be considered in a subsequent section.

As dephlogisticated air is found to support animal life for a much longer time than common air, it has been supposed that it might answer valuable purposes in medicine, provided any cheap method of procuring it in large quantities could be fallen upon. With this view, Mr Cavallo proposes to distil it from nitre with a strong heat; but the experiments already related certainly point out an easier method, free from the expence and trouble which must necessarily attend every chemical operation of this kind.

§ 2. *Properties of Dephlogisticated Air.*—This kind of air possesses some of the properties of common air in a very eminent degree, but is deficient in others. Those in which it excels, are the support of flame and of animal life. It is equally elastic, or rather more so, than common air; as it likewise exceeds it a little in specific gravity, the proportion betwixt it and common air being that of 160 to 152. On introducing a lighted candle into dephlogisticated air, the flame not only grows larger, but becomes exceedingly bright; and when the air is very pure, the candle burns with a crackling noise, as if the air contained some combustible matter, at the same time that the wax or tallow wastes surprisingly fast.

The heat of the flame is in proportion to its light. If we fill a bladder with dephlogisticated air, and then fasten to its neck a glass tube whose aperture is drawn to a fine point, the dephlogisticated air, if driven out by pressing the bladder, will augment the heat of a candle to such a degree, that if any small bits of metal, placed on a piece of charcoal, be held in the apex of the flame, they will almost instantly be melted. Even grains of platina may by this means be melted; and in a larger fire there is no doubt that the effects of burning mirrors might be equalled.

On mixing dephlogisticated and inflammable air together, an explosion takes place as on mixing common and inflammable air, but with much greater violence. If an ounce vial, which for this purpose should be very strong, be filled with a little more than one-third of dephlogisticated and the rest inflammable air, and the flame of a candle presented to its mouth, it will explode nearly as loud as a small pistol.

All phlogistic processes are promoted much better by dephlogisticated than common air. Dr Priestley put a quantity of pyrophorus into one of the small jars used for making experiments upon air in quicksilver; then filling up the vessel with that fluid, he inverted it in a basin of the same, and threw in dephlogisticated air at different times. It always occasioned a sudden and vehement accension, like the flashing of gun-powder, and the air was greatly diminished.

It has been, almost throughout all ages, believed, that combustion in every instance diminished common air, or reduced it to a smaller volume: but the late experiments of Mr Lavoisier have shown, that this is a mistake; and that in ordinary processes attended with the production of fixed and phlogisticated air, the quantity of vapour produced is equivalent to that absorbed, or otherwise made to disappear during the operation. With dephlogisticated air the case is very different. Mr Lavoisier having introduced a burning candle into a glass jar filled with very pure air obtained from calcined mercury, a great heat took place; which at first expelled a small quantity of the air; but afterwards, when the candle was extinguished, it was found that two thirds of the bulk of air employed had been converted into fixed air, or a quantity of this kind of air equivalent to the former had been produced. The remainder, after taking up the fixed air by caustic alkali, was still as pure as before. In the common processes, he observes, that not more than one-tenth of the air employed is converted into fixed air. In this experiment, the superior gravity of fixed air, and the consequent condensation of the other, must undoubtedly have produced some diminution in the volume of air, though Mr Lavoisier does not take notice of it. In other cases, however, the diminution is much more perceptible. Mr Scheele having introduced some live coals into a matrafs filled with dephlogisticated air, found that it was diminished by one-fourth of its quantity. Repeating the experiment with sulphur, the flame became larger and more vivid than in common air, and three-fourths of its quantity were lost. Putting a piece of phosphorus into seven ounce-measures of this kind of air, stopping the mouth of the bottle with a cork, and setting fire to the phosphorus within it, the vial broke in pieces, as soon as the flame was extinguished, by the pressure of the external air. Repeating the experiment with a stronger vial, and opening it afterwards under water, the fluid rushed into it in such a manner as almost to fill it entirely. This extraordinary diminution was also perceived on setting fire to inflammable air in the dephlogisticated kind. The way in which he accomplished this was, by filling a matrafs with dephlogisticated air, and inverting it over a phial containing an effervescing mixture of vitriolic acid and iron-filings plunged into a vessel of hot water, and furnished with a slender tube reaching above the surface of the vessel, as represented Plate VIII. fig. 2. The inflammable air issuing from the orifice of the small tube, was set on fire previous to the inversion of the matrafs, and the mouth of the latter immersed in the water; on which that fluid soon began to rise, and continued to do so till seven-eighths of the vessel were full. In cases of slow combustion, where common air is diminished and phlogisticated, the dephlogisticated kind was found to be almost entirely

Dephlogi-
ficated Air.57
Burns ve-
hemently
with pyro-
phorus.58
Common
air is not
diminished
by burning.59
But dephlo-
gisticated
air suffers
diminution.

Dephlogistified Air. Entirely destroyed. A phial, containing 20 ounce measures of dephlogistified air, and inverted into a solution of hepar sulphuris, was entirely filled with the latter in the space of two days.

60 Phenomena of dephlogistified air with nitrous air. The purity of dephlogistified air is ascertained by its degree of diminution with nitrous air; which, like that of the diminution by liver of sulphur, or otherwise, is to be considered as a phlogistic process, or kind of burning, especially as a considerable degree of heat is thereby generated. Very great differences are perceived in this respect; and according to the quantity of diminution, the air is said to be two, three, or four times better than common air. It is not yet accurately determined how far this proportionable purity extends. Dr Priestley mentions some extracted from red lead five times as pure as common air. Another quantity, produced from a solution of mercury in nitrous acid, was so pure, that one measure of it mixed with two of nitrous air, which had been obtained in the first part of the same process, occupied only 0.03 of a measure. "Repeating the experiment (says he), I found, that two measures of nitrous air were rather more than sufficient to saturate one measure of the dephlogistified air; so that possibly, had the former experiment been made with more circumspection, the diminution, extraordinary as it was, would have been somewhat greater. Indeed it cannot be supposed, that exactly two measures of nitrous air should be the precise quantity that would afford the greatest diminution. It should also be considered, that a small portion of air might be yielded by the water in which the experiments were made. Upon the whole, therefore, I am inclined to think, that, were it possible to make both the dephlogistified and nitrous air in the greatest purity, and then to mix them in some exact proportion, the aerial form of them both would be destroyed, the whole quantity seeming to disappear, as in the mixture of alkaline and acid air."

61 How dephlogistified air may be contaminated.

Notwithstanding this great degree of purity, the best dephlogistified air is capable of being contaminated by some of the processes which affect the common air of our atmosphere. Dr Priestley having introduced a quantity of very dry, clean nails, into a receiver filled with dephlogistified air, and inverted it in quicksilver, found, that about nine months after, one-tenth of the whole quantity had disappeared, tho' he could not perceive any rust upon the nails. The effects of combustion have already been related, viz. as producing a great quantity of pure fixed air; but putrefaction and animal respiration probably contaminate it in a manner similar to that of atmospherical air, though few or no experiments seem to have been made on this subject. Mr Cavallo, however, informs us, that "when an animal is confined in a quantity of dephlogistified air, and is kept therein till it dies, that air is not rendered so bad but that it will still be capable of considerable diminution by nitrous air. This seems to show, that dephlogistified air is somewhat different from pure common air; or that common air is originally different from dephlogistified air, lowered by the addition of phlogiston. The phenomenon is certainly very remarkable; and sometimes a quantity of dephlogistified air, after having been breathed by an animal till it died, will appear by the nitrous test to be even better than common air. When the expe-

riment is performed over lime-water (to absorb the fixed air produced in respiration), the diminution by a mixture of nitrous air is less than it would otherwise be; but it is still diminished much more than common air after an animal has died in it; which seems to intimate, that the death of the animal in dephlogistified air is principally owing to the fixed air formed by the act of respiration. It may be said, that the inflammable principle discharged through the lungs of an animal, being perhaps combined with some other principle, requires a longer time to combine with the dephlogistified air than the phlogiston of nitrous air; but this is only an hypothetical explanation of the abovementioned remarkable phenomenon, which requires many direct proofs."

62 Dephlogistified air is much inferior to that of the common atmosphere in supporting vegetable life. This has been ascertained by the experiments of Dr Priestley, Mr Fontana, Mr Scheele, Dr Ingenhousz, &c. Dr Priestley took three sprigs of mint, and having put all the roots into vials containing the same pump-water which had been for some time exposed to the atmosphere, introduced one of them into a jar of dephlogistified air, another into a jar of common air, and a third into that which had been phlogistified with nitrous air several months before, and in such a state, that one measure of it, and one of nitrous air, occupied the space of $1\frac{1}{2}$ measures. This was done in April; and on examining them on the 12th of May following, it was found, that the plant in phlogistified air had grown remarkably, much better than that in common air; while the plant in dephlogistified air had a very sickly appearance. Examining them on the 26th of the same month, the appearance continued nearly as before; but it was now found, that though the plant in phlogistified air had grown so well, the air was not sensibly improved by it, though the dephlogistified air was injured by the plant which grew in it.

63 § 3. Of the Composition of Dephlogistified Air.—When Dr Priestley first discovered the existence of this fluid, having found that it was always procured by means of earthy substances; and that as it came over, the bubbles appeared full of fine white powder; he concluded, that it is composed of the nitrous acid and earth, with as much phlogiston as is necessary to its elasticity; and that the common atmosphere has as much more as is necessary to bring it into the mean condition in which we find it. It was not long, however, before this theory met with opposition. Dr Priestley himself, though induced, from the waste of the solid matter used in his experiments, to conclude that the air contained some quantity of earth, was nevertheless unable, by any method he could think of, to ascertain that quantity. His experiments were opposed by others made by Lavoisier; who insisted, that when solution of mercury was carefully distilled, the metal was obtained in full quantity, or with scarce any loss, notwithstanding the dephlogistified air produced. This gentleman having put two ounces and one drachm of mercury into red precipitate, and afterwards revived it, lost a very few grains of the metal; which, he says, might be the weight of a little red matter that was found adhering to the neck of the vessel. The same thing was observed by Mr Fontana, who repeated the experiment often with less than a grain.

64 Difference betwixt Dr Priestley's and Mr Lavoisier's &c.

Dephlogi-
ficated Air.

grain weight of loss. The vessel he used had a neck of about two feet long: and he particularly remarks, that, in order to succeed in this experiment, the fire should be managed with very great dexterity; for if that be too strong, part of the precipitate will be volatilized, and then the result of the experiment is precarious.

These experiments were opposed by others made by Dr Priestley, who in several trials found that a considerable quantity of the metal was always lost. In one of these experiments, out of 11 pennyweights 10 grains of mercury, the loss amounted to one pennyweight two grains. In another experiment, 88 grains were lost, out of a quantity of red precipitate, in the preparation of which half an ounce of mercury had been employed. The quantity of mercury lost in his experiments, or rather the proportion of it to that of the metal employed, was always various, and the difference not very small; whence Mr Cavallo and others, with great appearance of reason, conclude, that the true reason of any perceptible loss was the strong heat made use of in the distillation, and consequently that there is no reason to suppose that any earth exists in dephlogisticated air.

65
Earth cannot be proved to exist in dephlogisticated air.

66
Whether the nitrous acid enters its composition.

The next question was, Whether any of the nitrous acid existed in dephlogisticated air? That it contains none in a proper state of acidity, is indeed evident from many decisive experiments; but an idea was naturally entertained, that in the formation of dephlogisticated air the nitrous acid was decomposed, and part of it entered into the composition of the aerial fluid. This gave rise to the theories of Mr Lavoisier and Mr Kirwan, which are noticed under the article Acid; as also the experiments of Mr Watt, which tended to show that no nitrous acid was destroyed in the composition of dephlogisticated air. To these Mr Kirwan replied in the manner related in that article. We shall here, however, give a quotation from Dr Priestley as a kind of addition to Mr Watt's testimony on this head, so that the reader may be the better able to determine the weight of the evidence on both sides.

"At Mr Watt's request (says he), I endeavoured to ascertain the quantity of acid that was expelled from nitre, in procuring the dephlogisticated air from it. To do this, I put two ounces of purified nitre into a glass retort, and receiving the air in 300 ounce measures of water, only filled each recipient half full, and agitated the air very much in the water, in order to make the fluid imbibe as much as possible of the acid it contained. Notwithstanding this agitation, however, every vessel of the air retained a strong smell of the acid. The moment the air ceased to come, I filled a large phial with the water, and carried it to Mr Watt, who carefully examined it; and in a paper which he presented to the Royal Society, and which is published in the Philosophical Transactions, he has given an account of the quantity of acid that was contained in all the 300 ounces of water: whence it may be fairly inferred, that there was no occasion to suppose that any of the acid entered into the composition of the air; but that it was all either rendered volatile or retained in the water." On the other hand, the Abbé Fontana informs us, that, in distilling an ounce of nitre with a strong heat, in order to expel dephlogisticated air from

it, only a few grains of weak nitrous acid are obtained, more or less as the fire applied is weak or strong; but that the quantity of dephlogisticated air extricated from it follows the contrary rule; being greatest when the heat is most violent and suddenly applied, and less when the fire is gradually applied.

On calcining metals in dephlogisticated air, very singular phenomena are observed, which seem to throw great light upon the composition of this fluid. "One of the most simple of all phlogistic processes (says Dr Priestley) is that in which metals are melted in dephlogisticated air. I therefore began with this, with a view to ascertain whether any water be produced when the air is made to disappear in it. Accordingly, into a glass vessel, containing seven ounce-measures of pretty pure dephlogisticated air, I introduced a quantity of iron turnings, which is iron in thin small pieces, exceedingly convenient for these and many other experiments, having previously made them, together with the vessel, the air, and the mercury by which it was confined, as dry as I possibly could. Also to prevent the air from imbibing any moisture, I received it immediately in the vessel in which the experiment was made, from the process of procuring it from red precipitate, so that it had never been in contact with any water. I then fired the iron by means of a burning lens, and presently reduced the seven ounce-measures to 0.65 of a measure; but I found no more water after this process than I imagined it had not been possible for me to exclude, as it bore no proportion to the air which had disappeared. Examining the residuum of the air, I found one-fifth of it to be fixed air; and when I tried the purity of that which remained by the test of nitrous air, it did not appear that any phlogisticated air had been produced in the process: for though it was more impure than I suppose the air with which I began the experiment must have been, it was not more so than the phlogisticated air of the seven ounce-measures, which had not been affected by the process, and which must have been contained in the residuum, would necessarily make it. In this case, one measure of this residuum, and two of nitrous air, occupied the space of 0.32 of a measure. In another experiment of this kind, ten-ounce measures of dephlogisticated air were reduced to 0.8 of a measure, and by washing in lime-water to 0.38 of a measure. In another experiment, 7½ ounce-measures of dephlogisticated air were reduced to half an ounce measure, of which one-fifth was fixed air, and the residuum was quite as pure as the air with which I began the experiment; the test with nitrous air, in the proportions above mentioned, giving 0.4 in both cases.

"In these experiments the fixed air must, I presume, have been formed by the union of the phlogiston from the iron and dephlogisticated air in which it was ignited; but the quantity of it was very small in proportion to the air which had disappeared; and at that time I had no suspicion that the iron, which had been melted and gathered into round balls, could have imbibed it; a melting heat having been sufficient, as I had imagined, to expel every thing that was capable of assuming the form of air from any substance whatever. Sensible, however, that such a quantity of air must have been imbibed by something, to which it must have given a very perceptible addition of weight, and

seeing

Se^t. III.

A E R O L O G Y.

Dephlogi-
ficated Air. feeling nothing else that could have imbibed it, it oc-
curred to me to weigh the calx into which the iron
had been reduced; and I presently found, that the
dephlogistified air had actually been imbibed by the
melted iron, in the same manner as inflammable air
had been imbibed by the melted calces of metals in my
former experiments, however improbable such an ab-
sorption might have appeared *a priori*. In the first
instance, about twelve ounce-measures of dephlogisti-
ficated air had disappeared, and the iron had gained six
grains in weight. Repeating the experiment very fre-
quently, I always found that other quantities of iron,
treated in the same manner, gained similar additions of
weight, which was always very nearly that of the air
which had disappeared.

68
Dephlogi-
ficated air
imbibed by
iron. 69
Is capable
of taking
it up from
the atmo-
sphere. "Concluding from the preceding experiments, that
iron, sufficiently heated, was incapable of saturating it-
self with pure air from the atmosphere, I then pro-
ceeded to melt it with the heat of a burning lens in
the open air; and I presently found, that perfect iron
was easily capable of being fused in this way, and con-
tinued in this fusion a certain time, exhibiting the ap-
pearance of *boiling* or throwing out air; whereas it
was, on the contrary, imbibing air; and, when it was
saturated, the fusion ceased, and the heat of the lens
could make no farther impression upon it. When this
was the case, I always found that it had gained weight
in the proportion of $7\frac{1}{2}$ to 24, which is very nearly
one-third of the original weight. The same was the
effect when I melted steel in the same circumstances,
and also every kind of iron on which the experiment
could be tried. But I have reason to think, that with
a greater degree of heat than I could apply, the iron
might have been kept in a state of fusion somewhat
longer, and by that means have imbibed more than
even one-third of its original weight.

70
Remark-
able pheno-
menon at-
tending the
melting of
cast iron. "There was a peculiar circumstance attending the
melting of cast iron with a burning lens, which ren-
dered it impossible to ascertain the addition that was
made to its weight, and at the same time afforded an
amusing spectacle: for the moment that any quantity
of it was melted, and gathered into a round ball, it
began to disperse in a thousand directions, exhibiting
the appearance of a most beautiful fire-work; some of
the particles flying to the distance of half a yard from
the place of fusion; and the whole was attended with
a considerable hissing noise. Some of the largest pic-
ces, which had been dispersed in this manner, I was
able to collect, and having subjected them to the heat
of the lens, they exhibited the same appearance as the
larger mass from which they had been scattered.

"When this cast iron was melted in the bottom of
a deep glass receiver, in order to collect all the par-
ticles that were dispersed, they firmly adhered to the
glass, melting it superficially, though without making
it crack, so that it was still impossible to collect and
weigh them. However, I generally found, that, not-
withstanding the copious dispersion, what remained af-
ter the experiment rather exceeded than fell short of
the original weight of the iron.

71
Formation
of water
from de-
phlogisti-
ficated and
inflam-
mable air. On attempting to revive this calx of iron in inflam-
mable air, a very new and unexpected appearance took
place. Having put a piece of iron saturated with pure
air into a vessel filled with inflammable air confined by
water, the inflammable air disappeared and the metal

was revived; but on weighing it, he found that $2\frac{1}{2}$
grains out of $11\frac{1}{2}$ had been lost, besides the $7\frac{1}{2}$ ounce-
measures of inflammable air which had vanished. Con-
sidering all these circumstances, the Doctor had now
no doubt that the two kinds of air had united and
formed either fixed air or water; and with a view to
determine this point, he repeated the experiment in a
vessel where the inflammable was confined by mercury,
both the vessel and mercury having been previously
made as dry as possible. In these circumstances he had
no sooner begun to heat the iron, than the air was
perceived to diminish, and at the same time the inside
of the vessel to become cloudy, with particles of dew
that covered almost the whole of it. These particles
by degrees gathered into drops, and ran down in all
places, excepting those which were heated by the sun-
beams. On collecting the water produced in this ex-
periment, by means of a piece of filtering paper care-
fully introduced to absorb it, he found it to be as near-
ly as possible of the same weight with that which had
been lost by the iron; and also in every experiment of
this kind, in which he attended to the circumstance,
he found that the quantity of inflammable air which
had disappeared was about double that of the dephlo-
gistified air set loose in the operation, supposing
that weight to have been reduced into air. Thus, at
one time, a piece of this slag absorbed $5\frac{1}{2}$ ounce mea-
sures of inflammable air, while it lost the weight of
about three ounce-measures of dephlogistified air,
and the water collected weighed two grains. Another
time a piece of slag lost 1.5 grains, and the water pro-
duced was 1.7 grains. In a third case, where $6\frac{1}{2}$ ounce-
measures of inflammable air were reduced to 0.92 of
a measure, the iron had lost the weight of 3.3 ounce-
measures of dephlogistified air, or nearly two grains.

72
Quantity
produced
in this man-
ner. The Doctor having succeeded so well with iron, next Experi-
mented the calx of copper, or those scales which fly off
from it by hammering whilst it is red-hot; and found
water produced in the inflammable air in the same
manner as when the scales of iron were used. On
using precipitate *per se*, he imagined at first that water
was obtained from this substance also; but on repeat-
ing the experiment to more advantage, he found no
more water than might be supposed to have been con-
tained as an extraneous substance either in the inflam-
mable air or in the red precipitate. With iron, how-
ever, the case was vastly different. As the Doctor
had formerly satisfied himself that inflammable air al-
ways contains a portion of water, and also that when
it has been some time confined by water, it imbibes
more, so as to be increased in its specific gravity by
that means, he repeated the experiment with inflam-
mable air which had not been confined by that fluid,
but was received in a vessel of dry mercury from the
vessel in which it had been generated; but in this case the
water was produced, to appearance, as copiously as in the
former experiment. "Indeed (says he), the quantity
of water produced, so greatly exceeding the weight of
all the inflammable air, is sufficient to prove that it
must have had some other source than any constituent
part of that air, or the whole of it, together with
the water contained in it, without taking into consi-
deration the corresponding loss of weight in the iron.

"I must here observe, that the iron slag which I
had treated in this manner, and which had thereby lost
the

Dephlogi-
ficated Air.74
Iron may
be made to
imbibe de-
phlogisti-
cated air as
often as we
please.75
Experi-
ments of
Mr Caven-
dish, &c. on
water.Phil. Transf.
lxxiv. 125.76
Whether
the phlogis-
tication of
air produces
vitriolic
acid.77
Nitrous acid
produced
from de-
phlogisti-
cated and in-
flam-
mable air.

the weight which it had acquired in dephlogisticated air, became perfect iron as at first, and was then capable of being melted by the burning lens again; so that the same piece of iron would serve for these experiments as long as the operator should choose. It was evident, therefore, that if the iron had lost its phlogiston in the preceding fusion, it had acquired it again from the inflammable air which it had absorbed; and I do not see how the experiment can be accounted for in any other way."

As these experiments of Dr Priestley tend very much to throw some light on the composition of dephlogisticated air, we shall here give an account of some others made by Mr Cavendish, as well as those of Dr Priestley and the French chemists, upon water: From all which it is concluded by the most celebrated philosophers and chemists, That dephlogisticated air is one of the constituent and elementary parts of water, inflammable air being the other; though the opinion is still contested by some foreign chemists.

"As there seemed great reason (says Mr Cavendish) to think, from Dr Priestley's experiments, that the nitrous and vitriolic acids were convertible into dephlogisticated air, I tried whether the dephlogisticated part of common air might not be converted into nitrous or vitriolic acid." For this purpose he impregnated some milk of lime with the fumes of burning sulphur, by burning 122 grains of sulphur in a large glass receiver, in which some lac calcis was included. No nitrous salt, nor any thing besides selenite, was produced in the process. Neither was any nitrous acid produced by phlogisticating common air with liver of sulphur, or by treating dephlogisticated air in the same manner. The liver of sulphur used in these experiments was made with lime; and the only observation made on this occasion was, that the selenite produced was much more soluble in water than when made with dephlogisticated vitriolic acid.

To try whether any vitriolic acid was produced by the phlogistication of air, 50 ounces of distilled water were impregnated with the fumes produced on mixing 52 ounce-measures of nitrous air with a quantity of common air sufficient to decompose it. This was done by filling a bottle with some of this water, and inverting it into a basin of the same; and then by a syphon, letting in as much nitrous air as filled it half full; after which, common air was added slowly by the same syphon, till the nitrous air was decomposed. When this was done, the distilled water was further impregnated in the same manner till the whole quantity of nitrous air was employed. The impregnated water was sensibly acid to the taste; and on distillation yielded first phlogisticated nitrous acid, then water, and lastly a very acid liquor consisting of dephlogisticated nitrous acid. By saturation with salt of tartar, 87½ grains of nitre, without any mixture of vitriolated tartar, or other vitriolic salt, were obtained.

These experiments having proved unsuccessful, Mr Cavendish next proceeded to try the effect of exploding dephlogisticated and inflammable air together in close vessels. He begins with relating an experiment of Dr Priestley; in which, it was said, that on firing a mixture of common and inflammable air by electricity, in a close copper vessel holding about three pints, a loss of weight was always perceived, on an average

Nº 4.

about two grains, though the vessel was stopped in such a manner that no air could escape by the explosion. It is also related, that on repeating the experiment, in glass vessels, the inside of the glass, though clean and dry before, immediately became dewy; which confirmed an opinion he had long entertained, that common air deposits its moisture by phlogistication. The experiment, however, did not succeed with Mr Cavendish, at least with regard to the loss of weight; which never exceeded the fifth part of a grain, and commonly was nothing at all. In these experiments the greatest care was taken to observe with accuracy the diminution of air by the explosion, and quality of the remainder; from which it appeared, that 423 measures of inflammable air were nearly sufficient to phlogistificate 1000 of common air, and that the bulk of air remaining after the explosion is very little more than four-fifths of the common air employed; whence he concludes, that "when they are mixed in this proportion, almost all the inflammable, and about one-fifth of the common air, lose their elasticity, and are condensed into the dew which lines the glass."

To examine more exactly the nature of this dew, 500,000 grain-measures of inflammable air were burnt with about 2½ times the quantity of common air, and the burnt air was made to pass through a glass cylinder eight feet long and three-fourths of an inch in diameter, in order to deposit the dew. The two airs were conveyed slowly into this cylinder by separate copper pipes, passing through a brass plate which stopped up one end of the cylinder; and as neither inflammable nor common air can burn by themselves, there was no danger of the flame spreading to the magazines from which they were conveyed. Each of these magazines consisted of a large tin vessel inverted into another just big enough to receive it. The inner vessel communicated with the copper pipe, and the air was forced out of it by pouring water into the outer vessel; and in order that the quantity of common air expelled should be 2½ times that of the inflammable air, the water was let into the outer vessels by two holes in the bottom of the same tin pan; the hole which conveyed the water into that vessel in which the common air was confined being 2½ times as big as the other. In trying the experiments, the magazines being first filled with their respective airs, the glass cylinder was taken off, and water let by the two holes into the outer vessels, till the airs began to issue from the ends of the copper pipes; they were then set on fire by a candle, and the cylinder put on again in its place. By this means upwards of 135 grains of water were left in the cylinder, which had no taste nor smell, and which left no perceptible sediment on being evaporated to dryness; neither did it yield any pungent smell during the evaporation; in short, it seemed pure water. In one of his experiments a little sooty matter was perceived, but it was found to proceed from the luting. On repeating the experiment with dephlogisticated, instead of common air, the produce was nitrous acid.

The following conclusion is drawn by Mr Cavendish from all these experiments: "There seem two ways by which the production of the nitrous acid, in the manner above-mentioned, may be explained: first, by supposing that dephlogisticated air contains a little nitrous acid, which enters into it as one of its component parts;

Dephlogi-
ficated Air.78
Quantity
of inflam-
mable air
necessary to
phlogisti-
cate com-
mon air.

Sect. III.

A E R O L O G Y.

Dephlogi-
ficated Air.

79
Conclusions
from these
experi-
ments.

parts; and that this acid, when the inflammable air is in sufficient proportion, unites to the phlogiston, and is turned into phlogisticated air, but does not when the inflammable air is in too small proportion; and, secondly, by supposing that there is no nitrous acid mixed with or entering into the composition of dephlogisticated air; but that, when the air is in sufficient proportion, part of the dephlogisticated air with which it is debased is, by the strong affinity of phlogiston to dephlogisticated air, deprived of its phlogiston, and turned into nitrous acid; whereas, when the dephlogisticated air is not more than sufficient to consume the inflammable air, none then remains to deprive the phlogisticated air of its phlogiston, and turn it into acid. If the latter explanation be true, I think we must allow that dephlogisticated air is in reality nothing but *dephlogisticated water*, or water deprived of its phlogiston; or, in other words, that water consists of dephlogisticated air united to phlogiston. On the other hand, if the former explanation be true, we must suppose that dephlogisticated air consists of water united to a little nitrous acid, and deprived of its phlogiston; but still the nitrous acid in it must only make a very small part of the whole, as it is found that the phlogisticated air into which it is converted is very small in comparison of the dephlogisticated air. I think the second of these explanations seems much the more likely; as it was found that the acid in the condensed liquor was of the nitrous kind, not only when the dephlogisticated air was prepared from nitrous acid, but when procured from plants or turbit mineral. Another strong argument in favour of this opinion is, that dephlogisticated air yields no nitrous acid when phlogisticated by liver of sulphur; for if this air contains nitrous acid, and yields it when phlogisticated by explosion with inflammable air, it is very extraordinary that it should not do so by other means. But what forms a stronger, and, I think, almost decisive argument in favour of this explanation, is, that when the dephlogisticated air is very pure, the condensed liquor is made much more strongly acid by mixing the air to be exploded with a little phlogisticated air."

80
Dr Priest-
ley's experi-
ments.

The experiments of Dr Priestley alluded to were those in which inflammable air was supposed by Mr Lavoisier to be procured from water by passing its steam through red-hot iron tubes. It was soon discovered, however, by Dr Priestley, that this inflammable air did not proceed from the water but from the iron of the tube; and might be obtained by transmitting aqueous vapour through charcoal or iron placed in tubes of copper, glass, or earthen ware, made red-hot, but not through these tubes by themselves. In this case, the loss of the water employed exceeded that of the inflammable air produced in the proportion of 1.3 to 2; and the iron which had thus absorbed the water, appeared exactly similar to that which had been burned in dephlogisticated air in the manner already related. His conclusions from thence are these: "Since iron gains the same addition of weight by being melted in dephlogisticated air, and also by the addition of water

81
His opinion
concerning
the compo-
sition of
water.

Vol. I. Part I.

when red hot, and becomes, as I have already observed, the same substance, in all respects, it is evident that this air or water, as existing in the iron, is the very same thing; and this can hardly be explained but on the supposition that water consists of two kinds of air, viz. inflammable and dephlogisticated."

Dephlogi-
ficated Air.

Of these processes he gives the following explanation: "When iron is heated in dephlogisticated air, we may suppose, that, though part of its phlogiston escapes, to enter into the composition of the small quantity of fixed air which is then procured, yet enough remains to form water with the dephlogisticated air which it has imbibed, so that this calx consists of the intimate union of the pure earth of iron and of water; and therefore, when the same calx, thus saturated with water, is exposed to heat in inflammable air, this air enters into it, destroys the attraction between the water and the earth, and revives the iron, while the water is expelled in its proper form."

The whole of the Doctor's opinions on the component parts of this kind of air, however, are summed up in the following sentence in his *Observations relating to Theory*.—"The only kind of air that is now thought to be properly elementary, and to consist of a simple substance, is dephlogisticated air; with the addition at least of the principle of heat, concerning which we know very little; and as it is not probable that this adds any thing to the *weight* of bodies, it can hardly be called an *element* in their composition. Dephlogisticated air appears to be one of the elements of water, of fixed air, of all the acids, and many other substances, which, till lately, have been thought to be simple."

The experiments of the French philosophers were of the same nature with those of Mr Cavendish, but conducted on a larger scale. The inference drawn from them was the same with that already mentioned, viz. that dephlogisticated and inflammable air in all cases are the two constituent parts of water. This opinion is adopted by Mr Kirwan in his *Treatise on Phlogiston*. "The experiments of Mr Cavendish, and of Mr Monge," says he, "appear to me to leave no room to doubt, that, when very pure dephlogisticated and inflammable air are inflamed, the product is mere water (A); for when these airs are employed in the proper proportion, only 0.02 of the mixture of both airs retains its aerial form. Now it is impossible to suppose that all the water obtained pre-existed in these airs; that is, that 49 parts in 50 were mere water."

Notwithstanding these positive conclusions, however, by some of the most respectable names in this country, the evidences adduced have been unsatisfactory to some French chemists, who maintain, that Messrs Cavendish, Priestley, and Kirwan, are totally mistaken with regard to the production of water from dephlogisticated and inflammable air; contending, that the water obtained had previously existed in the air, and was not originally produced in the operation. The fact, indeed, becomes somewhat dubious from some experiments related by Dr Priestley himself, and of which we shall now proceed to give an account.

82
Experi-
ments of
the French
philoso-
phers.

83
Mr Kir-
wan's con-
clusions
from them.

X

One

(A) The experiments of Mr Cavendish show that nitrous acid is the product in this case. He takes notice of the difference between the result of the French experiments and his, but ascribes it to their using inflammable air prepared from charcoal: His was from zinc.

Dephlogi-
ficated Air.85
Difficulties
arising in
some of Dr
Priestley's
experi-
ments.

One consequence of the hypothesis in question is evident, that if water really be *produced* by the deflagration of either dephlogistified or common air with inflammable air, the quantity of liquid obtained ought to increase in proportion to the quantity of the two airs consumed, and that without any limitation. This, however, is not the case, as Dr Priestley has observed. He had succeeded indeed with scales of iron and copper, as has already been related; and in the experiment with the latter, the production of water was so copious, that when only $3\frac{1}{2}$ ounce-measures of air were absorbed, the water stood in drops on the inside of the vessel, and some of these ran down it. Water was also procured by firing dephlogistified and inflammable air from iron by the electric spark in a close vessel; an experiment similar to those made by Mr Lavoisier at Paris. In his first experiment he put 3.75 ounce measures of a mixture of air, of which one-third was dephlogistified and two-thirds inflammable air from iron, in a close vessel, and, after the explosion, found in it one grain of moisture; but on repeating the experiment with half as much dephlogistified as inflammable air, he could perceive no sign of moisture. The greatest difficulty, however, which he says he ever met with respecting the preceding theory, arose from his never having been able to procure any water when he revived red precipitate in inflammable air, or at least no more than might have been supposed to be contained in the inflammable air as an extraneous substance.

In order to make the experiments with the scales of iron and that with the red precipitate as much alike as possible, and compare them both to the greatest advantage, he made them one immediately after the other, with every circumstance as nearly the same as he could. The inflammable air was the same in both experiments, and both the scales of iron and red precipitate were made as dry as possible. They were heated in vessels of the same size and form, and equally confined by dry mercury; and yet, with the former, water was produced as copiously as before, viz. running down the inside of the vessel in drops, when only four ounce-measures of inflammable air were absorbed; but though he heated the red precipitate till eight ounce-measures of the inflammable air were absorbed, and only 0.75 of an ounce-measure remained, there was hardly any sensible quantity of water produced, "certainly," says he, "not one-tenth of what appeared in the experiment with the scales of iron. In this experiment there can be no doubt but that the dephlogistified air produced from the red precipitate united with the inflammable air in the vessel; and as no *water* equal to the weight of the two kinds of air was produced, they must have formed some more *solid substance*, which, in the small quantities I was obliged to use, could not be found.

"The difficulty, with respect to what becomes of the two kinds of air, was not lessened by the attempts which I made to collect all that I could from repeated decompositions of inflammable and dephlogistified air in a close vessel. As I had produced water in this process when no more than a single explosion was made at a time, I thought that, by continuing to make explosions in the same vessel, the water would not fail to accumulate till any quantity might be collected; and I intended to have collected a considerable part of an ounce. And as I should know exactly what quantity

of air I decomposed, I had no doubt of being able to ascertain the proportion that the water and air bore to each other. With this view a mixture was made of a large quantity of air, one-third dephlogistified and two-thirds inflammable, from iron and oil of vitriol. But, though I had a sensible quantity of water at the first explosion (in each of which between four and five ounce-measures of the mixture of air were used,) I was surprised to perceive no very sensible increase of the quantity of water on repeating the explosions. Having therefore expended 48 ounce-measures of the mixture, the process was discontinued; and, collecting the water with all the care that I could, I found no more than three grains, when there ought to have been eleven.

"In this process the inside of the vessel was always very black after each explosion; and when I poured in the mercury after the explosion, though there was nothing visible in the air within the vessel, there issued from the mouth of it a dense vapour. This was the case, though I waited so long as two minutes after any explosion, before I proceeded to put in more mercury in order to make another; which, if the vapour had been steam, would have been time more than sufficient to permit it to condense into water. I even perceived this vapour when I had a quantity of water in the vessel, and the explosion was consequently made over it, as well as in contact with the sides of the vessel which were wetted with it; so that, as this vapour had passed through the whole body of water when the vessel was inverted, it is probable that it must have consisted of something else than mere water. But I was never able to collect any quantity of it, though it must have been something produced by the union of the two kinds of air."

In order to collect a quantity of this vapour, he contrived an apparatus, which, by diffusing it through a thin glass vessel, he supposed would condense all the contents whether fluid or solid; but, after repeating the experiment as carefully as possible, by taking 20 explosions, and repeating the whole several times over, he could find nothing in the vessel besides a small quantity of water, which, added to that in the strong vessel, came far short of the weight of the air that was decomposed.

"All the conjecture," says he, "that I can advance, in order to explain this phenomenon, is, that since foot yields pure air, part of the foot is formed by the union of the dephlogistified air in the atmosphere, and the inflammable air of the fuel: but *smoke*, which contains much *foot*, is soon dispersed, and becomes invisible in the open air. Such, therefore, may be the case here. The foot formed by the union of the two kinds of air, may be diffused through the air, in the vessel in which they are exploded, and be carried invisibly into the common atmosphere; which may account for my not being able to collect any quantity of it in this apparatus."

Not discouraged by this bad success, the Doctor attempted to collect this volatile matter by means of a quantity of water incumbent upon the mercury in the strong glass vessel in which the explosions were made, though he had found that part of it could escape through the water. He decomposed a great quantity of the two kinds of air in these circumstances; and presently

Dephlogi-
ficated Air.86
Inconden-
sible vapour
arising from
water.87
Priestley's
conjecture
concerning
this vapour.88
Unsuccess-
ful attempts
to collect it.

Dephlogi-
ticated Air. sently found that the water became very cloudy, and was at length filled with a blackish matter. This he collected, and found that it remained perfectly black upon the earthen vessel in which the water containing it was evaporated; which would not have been the case if the blackish matter in the water had been that powder of mercury which is produced by agitating it in pure water: For that black mass always became white running mercury the moment the water was evaporated from it. If a sufficient quantity of this matter could have been procured, he could have satisfied himself whether it was foot or not.

89
Water in
consider-
able quan-
tity obtain-
ed from de-
phlogistica-
ted and in-
flammable
air.
See Plate
VIII. fig. 3.

"That water, in great quantities (says he), is sometimes produced from burning inflammable and dephlogisticated air, is evident from the experiments of Messrs Cavendish and Lavoisier. I have also frequently collected considerable quantities of water in this way, though never quite so much as the weight of the two kinds of air decomposed. My apparatus for this purpose was the following: Into the mouth of a large glass balloon I introduced a tube, from the orifice of which there continually issued inflammable air from a vessel containing iron and oil of vitriol. This being lighted, continued to burn like a candle. Presently after the lighting of it, the inside of the balloon always became cloudy, and the moisture soon gathered in drops, and settled in the lower part of the balloon. To catch what might issue in the form of vapour, in the current of air through the balloon, I placed the glass tube *b*, in which I always found some water condensed. It is very possible, however, that in both these modes of experimenting, the water may be converted into a kind of vapour, which is very different from steam, and capable of being conveyed a great way through air, or even water, without condensation along with the air with which it is mixed; and on this account it may not be possible, in either of these modes of experimenting, to collect *all* the water into which the two kinds of air may be converted. The nature of this kind of vapour into which water may be changed, and which is not readily condensed by cold, is very little understood, but well deserves the attention of philosophers.

"That the water collected in the balloon comes from the decomposition of the air, and not from the fresh air circulating through it, was evident from placing balls of hot iron in the place of the flame, and finding, that, though the balloon was as much heated by them as by the flame of the burning of the inflammable air, and consequently there must have been the same current of the external air through it, no moisture was found in the balloon."

SECT. IV. Of Phlogisticated Air.

89
Phlogisti-
cation of air
explained.

THE universal prejudice in favour of the existence of that principle named *Phlogiston*, first suggested by Stahl, gave rise, on the first appearance of Dr Priestley's discoveries, to a theory, concerning the action of this substance upon air and other bodies. As it has been observed, that air was diminished, in some cases at least, by burning, universally by respiration, and by some other processes, it was imagined that phlogiston was a body of such a singular nature, that, when mixed with air, it always diminished

its bulk, instead of enlarging it, which might have been more naturally expected from the mixture of any vapour whatever. It was also supposed by some, that the phlogiston was not only entirely devoid of gravity, but that it was a principle of *positive levity*; so that the *absolute* weight of bodies was diminished by an union with it, and augmented when it was expelled, though their *specific* gravity was diminished. Various other surprising properties were attributed to phlogiston; such as that of giving elasticity to air, of constituting flame by a *chemical combination* with air, &c. Its emission into the atmosphere was supposed to be always attended with a diminution of air; and therefore, all processes in which air was diminished and become noxious, such as that by liver of sulphur, a mixture of iron filings and brimstone, &c. were called *phlogistic processes*. Respiration of animals was taken into the same account; but neither in this, nor in combustion, was it allowed that any kind of vital spirit was absorbed by the blood, or separated from the air by the burning body. On the contrary, it was strenuously argued, that all this was performed by the *emission* of *phlogiston* from the lungs or the inflamed substance, which depraved the air, and diminished it in bulk; and as all air was supposed to contain phlogiston, it was likewise imagined, that in all cases where air was mended, as by the growing of vegetables, or agitation in water, the emendation was accomplished, not by the emission of any thing into the atmosphere, but by the mere absorption of phlogiston. In other respects this substance was thought to be an exceedingly powerful principle in nature; the light of the sun itself and the electric fluid being said to be modifications of it, the different kinds of airs to be *phlogistic vapours*, &c.; so that the whole system of nature seemed ready to be absorbed by it at once.

The formidable powers of this principle were first checked by the discoveries of Mr Lavoisier, though the latter erred equally on the contrary side; and, not content with keeping the phlogistic principle within due bounds, would needs deny its existence altogether *. In a treatise published in the year 1782, he first impugns Dr Priestley's theory of respiration, and denies that "the respiration of animals has the property of phlogisticating air in a manner similar to what is effected by the calcination of metals and many other chemical processes; and that it ceases not to be respirable till the instant when it becomes furcharged, or at least saturated, with phlogiston."

In order to disprove this assertion, he introduced four ounces of mercury to 50 cubic inches of common air, proposing to calcine the metal by keeping it for 12 days in a heat almost equal to that which is necessary to make it boil. After the expiration of the appointed time, 45 grains of precipitate *per se* were formed, and the air in the vessel was diminished by about $\frac{1}{10}$ th of its volume. In this state it did not precipitate lime water; but instantly extinguished candles, and killed animals immersed in it; no longer affording any red vapours, or being diminished by mixture with nitrous air: On distilling the precipitate produced, about as much dephlogisticated air was obtained as had been left by the common air in the calcination; and by recombining this with the noxious air left in the vessel, he recomposed a fluid nearly of the same goodness with common air. Hence he draws the following conclusions:

Phlogisti-
cated Air.

90
Too great
powers at-
tributed to
phlogiston.

91
Doctrine of
phlogiston
opposed by
the foreign
chemists.
* See *Phlo-
giston*.

92
Mr Lavoisier's expe-
riments on
calcination
of metals
and respira-
tion.

Phlogistified Air.

93
Composition of atmospheric air.94
Effects of respiration on air.95
Scheele's experiments.96
Composition of atmospheric air demonstrated.

sions: 1. That $\frac{5}{8}$ ths of the air we breathe are mephitic, or incapable of supporting the respiration of animals, or the inflammation and combustion of bodies. 2. That the surplus, or only $\frac{1}{8}$ of the volume of atmospherical air, is respirable. 3. That, in the calcination of mercury, this metallic substance absorbs the salubrious part, leaving only the mephitic portion of the air. 4. That by reuniting these two portions which had been separated, we can recompound air similar to that of the atmosphere.

To determine the effects of respiration upon air, a live sparrow was placed under a glass receiver, filled with common air and inverted in mercury, containing 31 cubic inches. In a quarter of an hour it became agitated, and in 55 minutes died convulsed. Notwithstanding the heat of the animal, which necessarily, at first, rarified the air in the receiver, there was a sensible diminution of its bulk; which, at the end of 15 minutes, amounted to one-fortieth: but, instead of increasing afterwards, the diminution became something less in about half an hour; and when the animal was dead, and the air in the receiver had recovered the temperature of the room where the experiment was made, the diminution did not appear to exceed one-sixtieth part.—This air which had been respired by the sparrow, though in many respects similar to that in which the mercury had been calcined, differed from it in this respect, that it precipitated lime-water, and, by introducing caustic fixed alkali to it, was reduced one-sixth in bulk by the absorption of fixed air; after which it appeared exactly the same with that produced by the calcination of mercury or other metals; and atmospherical air was recomposed by mixing this with pure dephlogistified air in the proportions already mentioned.

That common air is compounded of two kinds of elastic fluids, Mr Scheele has proved by the following experiment: "I dissolved (says he) one ounce of alkaline liver of sulphur in eight ounces of water; of this solution I poured four ounces into an empty bottle, whose capacity was 24 ounces, and worked it well; then I turned the bottle, immersed its neck into a small vessel with water, and kept it in this position a fortnight. The solution had partly lost its red colour, and some sulphur had been precipitated from it during this time. After this I put the bottle in the same position in a larger vessel with water, keeping the mouth and neck under water, and the bottom of the bottle above water, and thus I drew the cork under water, which immediately rushed with violence into the bottle. On examining the quantity of water in the bottle, it was found, that during this fortnight, six parts out of 20 of air were lost." On repeating the experiment with the same materials, and in the same bottle, only four parts out of 20 were lost by standing a week, and no more than six after four months.

From these experiments, and many others similar, it appears that the doctrine of phlogiston had been carried too far by Dr Priestley and other British philosophers, and that the air consists of two kinds of fluids; one perfectly salutary, and friendly in the highest degree to animal life; the other altogether unfit for it. These two appear incapable of being converted directly into one another by any process, natural or artificial: for though both are destructible, yet they are always converted into other substances; from which,

indeed, either the one or the other may be extracted at pleasure by employing the proper methods. The strongest arguments in favour of the transmutation of phlogistified air into that of a purer kind, were drawn from the purification of noxious air by vegetation, and by agitation in water. In the former case, however, it has been observed in the last section, that this seeming purification is no other than an exchange of the one air for the other; the vegetables absorbing the phlogistified, and emitting the dephlogistified air in its stead. With respect to the agitation in water, the matter remained more dubious; and it is only in the last volume of Dr Priestley's treatise that we have any account of this being accomplished by an emission of purer air from the water.—"In the infancy of my experiments," says he, "I concluded, that all kinds of air were brought by agitation to the same state; the purest air being partially phlogistified, and air completely phlogistified being thereby made purer; inflammable air also losing its inflammability, and all of them brought into such a state as that a candle would just go out in them. This inference I made from all the kinds of air with which I was then acquainted, and which did not require to be confined by mercury, being brought to that state by agitation in a trough of water, the surface of which was exposed to the open air; never imagining, that when the air in my jar was separated from the common air by a body of water, generally about twelve inches in depth (adding that within to that without the jar), they could have any influence on each other. I have, however, been long convinced, that, improbable as it then appeared to me, this is actually the case."

This remarkable fact is illustrated by the following experiments: 1. About three ounce-measures of air, phlogistified by nitrous air, were agitated for a quarter of an hour in a vessel containing 20 ounces of water, which had been boiled for several hours, and which was still very warm. By this process it became diminished one-sixth, and considerably improved in quality. The next day the remainder was agitated for another quarter of an hour, and the water which had been boiled at the same time, when it was also diminished in quantity, and improved in quality. 2. An equal quantity of air, phlogistified by means of iron-filings and brimstone, being agitated for 20 minutes, was diminished by one-seventh, and improved so far that a candle would burn in it. 3. After expelling all the air he could from a quantity of water by boiling, he put to it, in separate phials, air that had been phlogistified with iron-filings and brimstone, as well as that which the heat had expelled, leaving them with their mouths in water, and agitating them occasionally. On examining the phials in about two months, he found both the air that was confined by water, and that which had been expelled by heat, completely phlogistified. 4. That water does imbibe the purer part of the atmosphere, in preference to that which is impure, is evident, he says, from any examination of it: For if the water be clear, and free from any thing that is putrescent, the air expelled from it by heat is generally of the standard of 1; whereas that of the atmosphere, when the nitrous air is the purest, is about 1.2.

Phlogistified air is equally invisible with common air, and something more elastic. Mr Kirwan procured

97
How air is purified by agitation in water. Exper. and Observ. vi. 385.98
Water pervious to air, and purifies it in passing through.99
Properties of phlogistified air.

Sect. IV.

A E R O L O G Y.

Phlogistified Air.

cured some perfectly phlogistified, so that it was not in the least diminished by nitrous air, from a mixture of iron-filings and brimstone. Having dried it by frequently introducing dry filtering paper under the jar that contained it, he found its weight to be to that of the common air as 985 to 1000, the barometer standing at 30.46 and the thermometer at 60°. The other properties of it are, that it is extremely fatal to animal life, and friendly to that of vegetables, insomuch that it is now generally believed to be the true and proper nourishment of the latter. It seems to exist originally, in very large quantity, in our atmosphere. It may be separated from the common mass of air by combustion, by respiration, by putrefaction, and in short by every species of phlogistic process; neither is there any other species of air but what may be converted into this by means of fire, dephlogistified air alone excepted.

100
Nitrous acid procured from phlogistified air.

Phlogistified air is now generally believed to be a combination of the nitrous acid with phlogiston; and that, in its gradual progress towards this, which is its ultimate stage, it first assumes the character of phlogistified nitrous acid; then of nitrous air, in which it readily parts with its phlogiston to the atmosphere, or rather to the dephlogistified part of it; and, lastly, it becomes phlogistified air, in which the union betwixt the principles is so strong, that it cannot be broken by simple exposure to dephlogistified air without heat; though the experiments of Mr Cavendish show, that this may be done by means of the electric spark, which produces the most violent heat we can imagine.

It had been frequently observed, that common atmospheric air was always diminished by taking the electric spark in it; and this diminution was supposed to be occasioned by the *phlogistication* of the air, and separation of its fixed part; in consequence of which it was urged, that lime-water is precipitated by taking the electric spark over it in a small quantity of air.

101
Mr Cavendish's experiments on the production of nitrous acid.

Mr Cavendish, however, who has carefully examined this subject, denies that any fixed air is produced in this manner; and, by a set of very curious experiments, published in the 75th volume of the Philosophical Transactions, has clearly shown that nitrous acid, and not fixed air, is the product of this operation.

The apparatus used in these experiments, was that represented Plate VIII. fig. 4. and consists only of a crooked glass tube, whose ends are plunged into quicksilver contained in two glasses, in the middle part of which the air is confined betwixt the two portions of quicksilver. The air was introduced by means of a smaller tube, fig. 5. the tube M of the former figure being filled with quicksilver, the bent end of which was introduced into a jar DEF, filled with the proper kind of air, and inverted in water. The end C being stopped by the finger, the quicksilver was thus prevented from falling out, let the tube be placed in what position it would, until this pressure was removed. Upon introducing the crooked tube into the jar in the position represented in the figure, and removing the finger from the orifice at C, the quicksilver would descend: and by stopping this orifice again, any quantity of the fluid may be allowed to run out, and the empty space of the tube will be filled with the air desired. Having thus got the proper quantity of air into the tube ABC, it was held with the end C uppermost, and stopped with the finger; and the end A,

made smaller for that purpose, being introduced into the end of the bent tube M, the air, on removing the finger from C, was forced into that tube by the pressure of the quicksilver in the leg BC. Thus he was enabled to introduce any quantity he pleased of any kind of air into the tube M; and by the same means it was in his power to let up any quantity of soap-ley, or other liquor, which he wanted to be in contact with it. In one case, however, in which he wished to introduce air into the tube many times in the same experiment, he made use of the apparatus represented fig. 6. consisting of a tube AB, of a smaller bore, a ball C and a tube DE of a larger bore. This apparatus was first filled with quicksilver; and then the ball C and the tube AB were filled with air, by introducing the end A under a glass inverted into water, which contained the proper kind of air, and drawing out the quicksilver from the leg ED by a syphon. After being thus furnished with air, the apparatus was weighed, and the end A introduced into one end of the tube M, and kept there during the experiment; the way of forcing air out of this apparatus into the tube being by thrusting down the tube ED, a wooden cylinder of such a size as almost to fill up the whole bore, and by occasionally pouring quicksilver into the same tube, to supply the place of that pushed into the ball C. After the experiment was finished, the apparatus was weighed again, which showed exactly how much air had been forced into the tube M during the whole experiment; it being equal in bulk to a quantity of quicksilver, whose weight was equal to the increase of weight of the apparatus. The bore of the tube M, used in these experiments, was about the tenth of an inch in diameter; and the length of the column of air occupying the upper part of the tube was in general from $\frac{3}{4}$ ths to $1\frac{1}{2}$ inches. In order to force an electrical spark through the tube M, it was necessary to place an insulated ball at such a distance from the conductor as to receive a spark from it, and to make a communication between that ball and the quicksilver in one of the glasses, while the quicksilver in the other glass communicated with the ground.

When the electric spark was made to pass through common air included between short columns of a solution of litmus, the solution acquired a red colour, and the air was diminished, as had been observed by Dr Priestley. When lime-water was used instead of the solution of litmus, and the spark was continued till the air could be no farther diminished; but not the smallest cloud be perceived in the water, though the air was reduced to two thirds of its original bulk; which is a greater diminution than it could have suffered by any phlogistic process, that being little more than one-fifth of the whole. The experiment being repeated with impure dephlogistified air, a great diminution took place, but without any cloud in the lime-water. Neither was any cloud produced when fixed air was let up into it; but, on the addition of a little caustic volatile alkali, a brown sediment immediately appeared.

It being thus evident that the lime was saturated by some acid produced in the operation, the experiment was repeated with soap-leys, to discover the nature of it. A previous experiment had been made, in order to know what degree of purity the air ought to be of to produce the greatest diminution; and thus it was found,

Phlogistified Air.

102
Proportions
of the dif-
ferent airs
necessary
for the pro-
duction of
nitrous acid.

found, that when good dephlogistified air was used, the diminution was but small; where perfectly phlogistified air was made use of, no sensible diminution took place; but when five parts of pure dephlogistified air were mixed with three of common air, almost the whole was made to disappear. It must be remembered, that common air consists of one part of dephlogistified, and four of phlogistified air; so that a mixture of five parts of pure dephlogistified air and three of common air, is the same thing as a mixture of seven parts of dephlogistified air with three of phlogistified. Having made these previous trials, he introduced into the tube a little soap-leys, and then let up some dephlogistified and common air mixed in the above mentioned proportions, which, rising into the tube M, divided the soap-leys into its two legs. As fast as the air was diminished by the electric spark, he continued to add more of the same kind till no further diminution took place. The soap-leys being then poured out of the tube, and separated from the quicksilver, seemed to be perfectly neutralized, as they did not at all discolour paper tinged with blue flowers. On evaporating the liquid to dryness, a small quantity of salt was left, which was evidently nitre, from the manner in which a paper impregnated with the solution of it burned. On repeating the experiment on a larger scale, with five times the quantity of materials, pure nitre was obtained in proportion, and was found, by the test of *terra ponderosa salita*, to contain no more vitriolic acid than what might have been expected in the soap ley itself, and which is exceedingly small.

103
Mr. Cavendish's opi-
nions on the
nature of
phlogistifica-
ted air.

As, in some former experiments of Mr Cavendish, it had been found, that, by deflagrating nitre with charcoal, the whole of the acid was converted into phlogistified air, he concluded that this kind of air is nothing else than nitrous acid united to phlogiston; according to which, it ought to be converted into nitrous acid by being deprived of its phlogiston. "But, (says he) as dephlogistified air is only water deprived of phlogiston, it is plain, that adding dephlogistified air to a body, is equivalent to depriving it of phlogiston, and adding water to it; and therefore phlogistified air ought also to be reduced to nitrous acid, by being made to unite or form a chemical combination with dephlogistified air; only the acid thus formed will be more dilute than if the phlogistified air was simply deprived of phlogiston.

"This being premised, we may safely conclude, that in the present experiments, the phlogistified air was enabled, by means of the electrical spark, to unite to, or form a chemical combination with, the dephlogistified air, and was thereby reduced to nitrous acid, which united to the soap-leys, and formed a solution of nitre; for in these experiments the two airs actually disappeared, and nitrous acid was formed in their room: and as it has been shown, from other circumstances, that phlogistified air must form nitrous acid when combined with dephlogistified air, the above mentioned opinion seems to be sufficiently established. And a further confirmation is, that no diminution of air is perceived when the electric spark is passed either through pure dephlogistified or through perfectly phlogistified air; which indicates a necessity for the combination of the two, in order to produce nitrous acid. It was also found by the last experiment, that the

quantity of nitre produced was the same that would have been obtained from the soap-leys, had they been saturated with nitrous acid; which shows that the production of the nitre was not owing to any decomposition of the soap-leys.

"The soap-leys used in the foregoing experiments were made from salt of tartar prepared without nitre, and were of such a strength as to yield one-tenth of their weight of nitre when saturated with nitrous acid. The dephlogistified air was also produced without nitre; that used in the first experiment with the soap-leys being procured from the black powder formed by the agitation of quicksilver mixed with lead, and that used in the latter from turbith mineral. In the first experiment, the quantity of soap-leys used was 35 measures, each of which was equal in bulk to one grain of quicksilver; and that of the air absorbed was 416 such measures of phlogistified air, and 914 of dephlogistified. In the second experiment, 178 measures of soap-leys were used; which absorbed 1920 of phlogistified air, and 4860 of dephlogistified. It must be observed, however, that in both experiments some air remained in the tube undecomposed, whose degree of purity I had no means of trying; so that the proportion of each species of air absorbed cannot be known with much exactness.

"As far as the experiments hitherto published extend, we scarcely know more of the nature of the phlogistified part of the atmosphere, than that it is not diminished by lime-water, caustic alkalis, or nitrous air; that it is unfit to support fire, or maintain life in animals; and that its specific gravity is not much less than that of common air: so that, though the nitrous acid, by being united to phlogiston, is converted into air possessed of these properties; and, consequently, though it was reasonable to suppose, that part at least of the phlogistified air of the atmosphere consists of this acid united to phlogiston; yet it might be fairly doubted whether the whole is of this kind, or whether there are not, in reality, many different substances confounded by us under the name of phlogistified air. I therefore made an experiment to determine whether the whole of a given portion of the atmosphere could be reduced to nitrous acid, or whether there was not a part of a different nature from the rest, which would refuse to undergo that change. For this purpose, I diminished a similar mixture of dephlogistified and common air in the same manner as before, until it was reduced to a small part of its original bulk; after which some dephlogistified air was added, and the spark continued until no further diminution took place. Having by these means condensed as much as I could of the phlogistified air, I let up some solution of liver of sulphur to absorb the dephlogistified air; after which only a small bubble of air remained unabsorbed, which certainly was not more than $\frac{1}{20}$ th of the bulk of the phlogistified air let up into the tube; so that, if there is any part of the phlogistified air of our atmosphere which differs from the rest, and cannot be reduced to nitrous acid, we may safely conclude that it is not more than $\frac{1}{20}$ th part of the whole."

Though these experiments had shown, that the chief cause of this diminution of airs is the conversion of the phlogistified kind into nitrous acid, it seemed not

104
Experi-
ment to de-
termine the
nature of
phlogistifica-
ted air.

Phlogi-
cated Air.105
Effects of
the electric
spark on
dephlogisti-
cated air in-
closed be-
tween diffe-
rent liquors.

not unlikely, that when any liquor containing inflammable matter was in contact with the air in the tube, some of this matter might be burnt by the spark, and thereby diminish the air. In order to determine this, the electric spark was passed through dephlogisticated air included between different liquors; and the result of the experiments was, that when dephlogisticated air, containing only $\frac{1}{20}$ th part of its bulk of phlogisticated air, was confined between short columns of soap-leys, and the spark passed through it till no farther diminution could be perceived, the air lost $\frac{4}{20}$ ths of its bulk; which is not a greater diminution than might very likely proceed from the decomposition of the small quantity of phlogisticated air contained in it, as the dephlogisticated air might easily be mixed with a small quantity of common air while putting into the tube. When the same dephlogisticated air was confined between columns of distilled water, the diminution was rather greater than before, and a white powder was formed on the surface of the quicksilver beneath: the reason of which, in all probability, was, that the acid produced in the operation corroded the quicksilver, and formed the powder; and that the nitrous air produced by that corrosion united to the dephlogisticated air, and caused a greater diminution than would otherwise have taken place. When a solution of litmus was used instead of distilled water, the solution soon acquired a red colour; which grew paler and paler as the spark was continued, till it became quite colourless and transparent. The air was diminished by almost one-half, and might perhaps have been further diminished had the spark been continued. When lime water was let up into the tube, a cloud was formed, and the air was further diminished by about one-fifth; the remainder was good dephlogisticated air. In this experiment, therefore, the litmus was, if not burnt, at least decomposed, so as to lose entirely its purple colour, and to yield fixed air; so that, though soap-leys cannot be decomposed by this process, yet the solution of litmus can, and so very likely might the solutions of many other substances be. But there is nothing in any of these experiments which favours the opinion of the air being at all diminished by means of phlogiston communicated to it by the electric spark.

SECT. V. Of Fixed Air.

106
Fixed air
found in a
great varie-
ty of sub-
stances.

The discovery of this kind of air is as old as Van Helmont, who gave it the name of *gas silvestre*, from its being emitted in great quantity by burning charcoal. Subsequent discoveries showed, that a fluid of the same kind was plentifully produced by fermenting liquor, in almost every kind of combustion, and naturally generated in vast quantity in mines and coal-pits, where it is known by the name of the *choak-damp*; that it exists in a concrete state in alkaline salts, chalk, limestone, the shells of marine animals, magnesia alba, &c. in a very large proportion, constituting one-half, and sometimes more of their weight; and that it might always be extracted from the atmosphere, in unlimited quantity, by exposing certain substances to it.—On examining the nature of this fluid, it was found so manifestly acid, that it has now obtained a place among these substances, under the name of *aërial acid*;

or, more improperly, *cretaceous acid*, from its being contained in great quantities in chalk, as has been already mentioned.

Fixed air is the heaviest of all permanently elastic fluids, excepting those derived from the mineral acids. Mr Kirwan determines it to be to common air as 1500 to 1000, the barometer being at 29.85, the thermometer at 64, and the fixed air being extracted from calcareous spar by marine acid, whose specific gravity was 1.0145. He observes, however, that though this air was obtained in the driest manner possible, and that the globe which contained it appeared perfectly free from moisture; yet, when carried into a room 27 degrees colder, the inside of the globe was covered with dew, which soon formed visible drops. In its concrete state, fixed air is one of the heaviest bodies in nature. Mr Kirwan, in the 71st volume of the Philosophical Transactions, gives an account of his ingenious method of finding the specific gravity of fixed air in its fixed state, when combined with calcareous earth; from which it appears, that fixed air, in that state, is prodigiously concentrated, and, were it possible to exist by itself in that concentrated state, it would be the heaviest body known, gold and platina excepted.

Mr Kirwan first ascertained the specific gravity of a piece of white marble; then expelled the fixed air from a known weight of it finely powdered, by means of diluted vitriolic acid; the bulk and weight of the obtained fixed air being ascertained. Next, he calcined a known quantity of the same sort of marble, by keeping it in a white heat for the space of 14 hours; after which, being weighed again, and from the weight lost by this calcination, the weight of the fixed air, which must have escaped from it according to the above mentioned experiment, being subtracted, the remainder is the weight of water contained in the marble; from which experiments it appears, that 100 grains of the marble contained 32.42 grains of fixed air, 11.66 grains of water, and 55.92 grains of pure calcareous earth.

“ I next (says he) proceeded to discover the specific gravity of the lime. Into a brass box, which weighed 607.65 grains, and in the bottom of which a small hole was drilled, I stuffed as much as possible of the finely-powdered lime, and then screwed the cover on, and weighed it both in air and in water. When immersed in this latter, a considerable quantity of common air was expelled; when this ceased, I weighed it. The result of this experiment is as follows:

	Grains.
Weight of the box in air	607.65
Its loss of weight in water	73.75
Weight of the box and lime in air	1043.5
Weight of the lime singly in air	435.85
Loss of weight of the box and lime in water	256.5
Loss of weight of the lime singly	182.3

“ Hence, dividing the absolute weight of the lime by its loss in water, its specific gravity was found to be 2.3908.

“ From these data I deduced the specific gravity of fixed air in its fixed state; for 100 grains of marble consist of 55.92 of earth, 32.42 of fixed air, and 11.66 of water; and the specific gravity of the marble is 2.717. Now, the specific gravity of the fixed air, in its fixed state, is as its absolute weight, divided by its loss of weight in water; and its loss of weight in water is as the

107
Specific
gravity, &c.
of fixed air.

Fixed Air. the loss of 100 grains of marble, *minus* the losses of the pure calcareous earth and the water.

$$\text{Loss of 100 grs. of marble} = \frac{100}{2.717} = 36.8 \text{ grs.}$$

$$\begin{array}{rcl} \text{Loss of 55.92 grs. of calcareous} & & \\ \text{earth} & - & \\ & = \frac{55.92}{2.39} = & 23.39 \text{ grs.} \end{array}$$

$$\begin{array}{rcl} \text{Loss of 11.66 grs. of water} = & - & 11.66 \\ & & \hline & & 35.05 \end{array}$$

"Then the loss of the fixed air $36.8 - 35.05 = 1.75$; consequently its specific gravity is $\frac{32.42}{1.75} = 18.52$."

108
Its other
properties.

Fixed air differs considerably in its properties from the airs already mentioned. Its acidity is manifest to the taste, and still more from its neutralising both fixed and volatile alkalis; which it will do in such a manner as not only to destroy their causticity, but to give them a manifestly acid taste, and will moreover enable them to form crystals of a neutral or acidulous salt. It has a considerable antiseptic power, and will even check the putrefaction of animal substances; though it has been observed, that in this case it acts only by absorbing the putrid effluvia already emitted from the body, and becomes itself very offensive, while it sweetens the other. When taken into the lungs, it is equally poisonous with phlogisticated or any other noxious air, and extinguishes flame as effectually; but, when mixed with dephlogisticated air, may be inspired without any danger, and even in its pure state may be swallowed in large quantities, not only without danger, but with the most salutary effects in some diseases, whence it has now become an article of the *Materia Medica*. As an acid it stands in the lowest rank, being expelled from alkalis by every other; though it is capable of separating oils, sulphur, and the colouring matter of Prussian blue, from the substances with which they are combined.

109
Constituent
principles
of fixed air.

The origin of this acid was for a long time as much unknown as that of the others; and while the general prejudice remained, that acids were a kind of primary elements unchangeable in their nature, it was supposed that fixed air was some modification of the others, probably the nitrous. But the discoveries made of late years have abundantly shown, that the chemical principles are by no means so indestructible as they were imagined; and that the vegetable acids particularly, may be almost totally resolved into fixed air. Hence it was naturally suggested, that fixed air itself might be a compound of some other principles; and it was suggested by Dr Black, that it was a combination of atmospherical air with phlogiston. As the air of our atmosphere, however, is compounded of two substances, one of which naturally contains no phlogiston, and the other as much as it can hold; it seemed unlikely that there should be any possibility of adding to the quantity of phlogiston contained in a portion of the atmosphere, without decomposing it in some manner or other. Succeeding experiments evinced, that it was by a decomposition of the pure part of atmospherical air, and a combination of the phlogiston of the fuel with its basis, that fixed air was produced; and this fact was evinced by numerous experiments made by Mr Kirwan, Mr Lavoisier, and Dr Priestley, so that it is now looked upon to be generally established: and as the experiments

made by Dr Priestley appear fully as convincing as any, we shall here content ourselves with giving an account of them.

The compound nature of fixed air, and the principles from which it is formed, were first discovered by Mr Kirwan; but Dr Priestley was not convinced by the proofs he adduced, till after making some experiments of his own. The first was, by firing shavings of iron in dephlogisticated air; when he observed a considerable residuum of fixed air, though that in the receiver had been of the purest dephlogisticated kind, and iron could only have yielded inflammable air. The hypothesis of Mr Kirwan was still further confirmed by an experiment in which iron-filings, which could only have yielded inflammable air, were mixed with red precipitate, which is known to yield only pure dephlogisticated air. On heating these in a glass retort, they gave a great quantity of fixed air, in some portions of which nineteen-twentieths were absorbed by lime-water, and the residuum was inflammable; but when the red precipitate was mixed with powdered charcoal, which had been found to yield only inflammable air, the fixed air produced from it was so pure that only one-fortieth part remained unabsorbed by water, which is as pure as that generally prepared from chalk and oil of vitriol. In some of these experiments it appeared, that three ounce-measures of dephlogisticated air went to the composition of two of fixed air: for one ounce of red precipitate gave 60 ounce-measures of dephlogisticated air; and, when mixed with two ounces of iron filings, it gave about 40 ounce-measures of fixed air that were actually absorbed by water, besides a residuum that was inflammable. The same proportion was obtained when half the quantity of materials were made use of; but on using an ounce of each, only 20 ounce-measures of fixed air, including the residuum, could be got.

In considering this subject farther, it occurred to Dr Priestley, that his experiments, in which charcoal was used, lay open to an objection, that since dry wood, and imperfectly made charcoal, yield fixed air, it might be said, that all the elements of fixed air are contained in charcoal; and though this substance alone, even with the assistance of water, will not yield fixed air, this might be effected by treating it with other substances without their importing any thing to it; especially as the inflammable air procured from charcoal by means of water, appears to contain fixed air when decomposed with the dephlogisticated kind. In order to expel all the fixed air from charcoal, he made a quantity of it from dry oak, and, pounding it while hot, instantly mixed four measures of it with one of red precipitate, and, putting them into an earthen retort, got, with a heat no greater than what was sufficient to revive the mercury, a large quantity of air, half of which was fixed. Afterwards the proportion of fixed air was less, and at last no fixed air at all was obtained; but as the residuum was worse than the common atmosphere, he is thence inclined to believe, notwithstanding Mr Cavendish's experiments, that phlogisticated air may be composed of phlogiston and dephlogisticated air. In another experiment he found a better proportion of charcoal and red precipitate. This was by mixing one ounce of precipitate with the same quantity of perfect char-

111
Priestley's
opinion
concerning
the composition
of phlogisticated
air.

Fixed Air. charcoal hot from the retort in which it was made. Putting these into a coated retort, he expelled from them, by a strong heat, about 30 ounce-measures of air, the whole of which was the purest fixed air, leaving only about one-fortieth part unabsorbed by water, and this almost perfectly phlogisticated.

Having recollected that, in some former experiments, he had obtained fixed air from nitrous acid and charcoal, he therefore repeated the experiment with some of the same charcoal which had then been made use of; when fixed air was obtained, in the quantity sometimes only of one-fifth, and sometimes of one-half; to the formation of which he supposed the dephlogisticated air produced by heating the nitrous acid must have contributed. On account of the objections, however, which might be made to the use of charcoal, he next employed *iron*, which was liable to nothing of this kind; and on mixing an ounce of iron-filings with as much charcoal, and then heating them in a glass-retort, he obtained 20 ounce-measures of air, of which one-seventh remained unabsorbed by water. The residuum was of the standard of 1.52, but slightly inflammable. Repeating the experiment with half an ounce of iron filings, he got 26 ounce-measures of air, of which the first part was pretty pure, but afterwards one-tenth remained unabsorbed by water; but, on mixing one ounce of precipitate with two ounces of filings, he got about 40 ounce-measures of air, of the first portions of which only one-twentieth was unabsorbed by water, though towards the conclusion the residuum was greater. In this process he got in all 36 ounce-measures of pure fixed air, completely absorbed by water, besides about other four ounce-measures, which, he supposes, might have been absorbed in receiving the air, and transferring it into other vessels.

Fixed air was also produced from red precipitate mixed with brass filings, with zinc, from turbith mineral with iron-filings, and from the black powder into which mercury mixed with lead is easily converted. In this last case the Doctor supposes that the fixed air was produced from the dephlogisticated kind absorbed by the metals and the phlogiston of the lead; and this is confirmed by an observation, that the fixed air always comes first in the process, when the phlogiston is most readily separated, but afterwards the produce becomes quite pure and dephlogisticated. In attempting, however, to increase the quantity of fixed air by heating this black powder in dephlogisticated air, he found only an augmentation of the quantity of dephlogisticated air, and that of the purest kind.

"Perhaps," says he, "as decisive a proof as any of the real production of fixed air from phlogiston and dephlogisticated air, may be drawn from the experiments in which I always found a quantity of it when I burned sulphur in dephlogisticated air. In one of these experiments, to which I gave particular attention, six ounce-measures and an half of the dephlogisticated air were reduced to about two ounce-measures, and one-fifth of this was fixed air. When both the vitriolic acid and fixed air produced by this operation were absorbed by water, the remainder was very pure dephlogisticated air.

"I had always concluded, that no fixed air could be procured by the decomposition of inflammable air which had been produced by mineral acids, because I

had not been able to do it with that which I had got by means of vitriolic acid; but I learned from Mr *Metherie*, that this is peculiar to the vitriolic acid, the remains of which, diffused through the inflammable air, procured by it, he conjectures, may actually decompose the fixed air produced in the process. For, as I have hinted before, when the inflammable air is produced from iron by means of spirit of salt, there is a very perceivable quantity of fixed air when it is united with dephlogisticated air. When I decomposed these two kinds of air in equal quantities, they were reduced to about 0.5 of a measure, and of this not more than about one-fortieth part was fixed air. This experiment ought, however, to be added to the other proofs of fixed air being produced by the union of dephlogisticated air and phlogiston.

"The last instance which I shall mention, of the generation of fixed air from phlogiston and dephlogisticated air, is of a much more striking nature than any that I have yet recited. Having made what I call *charcoal of copper*, by passing the vapour of spirit of wine over copper when it was red-hot, I heated a piece of it in different kinds of air. In common air, observing neither increase nor decrease in the quantity, I concluded, perhaps too hastily, that no change was made in it; for, when I repeated the experiment in dephlogisticated air, the charcoal burned very intensely; and when a part of it was consumed, which (like common charcoal in the same process, was done without leaving any sensible residuum) I found that no heat which I could apply afterwards had any farther effect on what was left of the charcoal. Concluding, therefore, that some change must be made in the quality of the air, I examined it, and found about nine-tenths to be the purest fixed air; and the residuum was such as would have been made by separating the absolutely pure part of the dephlogisticated air, leaving all the impurities behind. Having ascertained this fact, I repeated the experiment, weighing the piece of charcoal very carefully before and after the process; and then found, that, by the loss of one grain of charcoal, I reduced four ounce-measures of dephlogisticated air till one-ninth only remained unabsorbed by water; and again, with the loss of one grain and an half of the charcoal, I reduced six and an half-measures of dephlogisticated air till five and an half-measures were pure fixed air. In this process there was a diminution of bulk after the experiment, as might have been expected from the change of the air into one of a heavier kind, by means of a substance or principle that could not add much to the weight of it. In one of the experiments, 4.3 ounce-measures of dephlogisticated air were reduced about one-thirtieth part of the whole; and in this case, when the fixed air was separated by water, there was a residuum of 0.75 of a measure of the standard of 1.0, whereas the dephlogisticated air, before the experiment, had been of the standard of 0.2.

"That dephlogisticated air actually enters into the composition of the fixed air, in this experiment, is evident from the weight of the latter, which far exceeds that of the charcoal dispersed in the process. For, in this last experiment, the weight of the fixed air produced was 4.95 grains. Consequently, supposing the charcoal to be wholly phlogiston, as it is very nearly so, fixed air may be said to consist of 3.45 parts of dephlogisticated

112
Proportion
of fixed air
produced
from de-
phlogistica-
ted air.

Fixed Air.

gisticated air, and 1.5 of phlogiston; so that the dephlogisticated air is more than three times the proportion of phlogiston in it.—I must not conclude, however, without observing, that, in one experiment, I never failed to produce fixed air; though it is not easy to see how *one* of its supposed elements, viz. dephlogisticated air, could enter into it. This is by heating iron in vitriolic acid air. In one of these experiments, four ounce-measures of the vitriolic acid air were reduced to 0.65 of an ounce-measure; and of the quantity lost three and an half measures were fixed air absorbed by lime-water, and the remainder weakly inflammable.”

113
Effects of
the electric
spark on
fixed air.

Fixed air, even when pure and unmixed, is remarkably altered by the electric spark, part of it being thus rendered immiscible in water. Dr Priestley, having taken the electric spark for about two hours in a small quantity of fixed air confined by mercury, found that, after the operation, one-fourth of it remained immiscible with water; though, before it, only one-thirtieth part had remained unabsorbed. The inside of the tube had become very black; which, in other experiments of a similar kind with vitriolic acid air, he had observed to arise from the adhesion of a small quantity of mercury supersaturated with phlogiston. In another experiment, in which the spark was taken an hour and ten minutes in about half an ounce-measure of fixed air, one-fifth remained unabsorbed, and the standard of the residuum was 0.9; though, before the operation, only one-thirtieth part had been absorbed, and the standard of the residuum was 1.0. In this experiment, also, he observed, that the air was increased about a twentieth part. On taking the electric spark an hour in half an ounce of fixed air, as much residuum was left as had remained in five times the quantity of the same fixed air in which no spark had been taken. This residuum was also much purer than that of the original fixed air, the standard being 0.8; whereas that of the original fixed air had been, as before, 1.0. On repeating the experiment, he found the residuum still greater, but equally pure; and, in this case, a good quantity of black matter was observed adhering to the tube. Having taken the spark in a small tube containing $\frac{1}{12}$ th of an ounce-measure of fixed air, the inside of the tube was clouded with black matter, and in the bottom was a small quantity of yellowish matter resembling sulphur; the residuum was between one-fourth and one-fifth of the whole, and less pure than formerly. This circumstance he also supposes to be a proof that fixed air may be composed of phlogiston and dephlogisticated air. Pursuing this experiment, by taking the electric spark three hours in a small quantity of fixed air, he observed that it was first increased, and then diminished about one-eighth of the whole; the inside of the tube being very black on the upper part, and below the mercury very yellow, for the space of a quarter of an inch all round the tube; but this space had been above the mercury in the beginning of the operation. One third of the air remained unabsorbed by water; but so impure, that the standard of it was 1.8, or almost completely phlogisticated.—Varying the process, by using water impregnated with fixed air instead of mercury, the quantity of air was much augmented by that which came from the water; but thus the far greater part of it was incapable of being absorbed by lime-water; and on this occasion he observed, that

114
Experi-
ment in fa-
vour of
Priestley's
hypothesis
concerning
the compo-
sition of
phlogistica-
ted air.

water impregnated with fixed air is a much worse conductor of electricity than the same fluid impregnated with mineral acids. On still varying the circumstances of the experiment, by using common water instead of that which had absorbed fixed air, he found that the quality of the residuum was evidently better than that of the original fixed air.

In order to discover whether the heat or light of the electric spark were the circumstances which effected the change, the Doctor threw a strong light, by means of a lens, for some hours, on a quantity of pounded glass confined in some fixed air; but, though the volume of residuum was thus somewhat increased, yet, as it was of the same quality with common air, he suspected that it might be only that portion which had been introduced among the particles of the glass. The quantity of air was increased after the operation. With glass-house sand made very hot, the quantity of air was likewise increased; but the experiment was not more satisfactory than the former. Heated bits of crucibles increased the quantity of residuum in the proportion of 10 to 6.6; but the quality was injured either directly by a comparison with nitrous air, or by producing a larger quantity of residuum equally bad. By heating iron, however, in fixed air, part of it was evidently converted into phlogisticated air. On heating turnings of malleable iron for some time in fixed air, one-tenth part of it was rendered immiscible with water; and, on repeating the process with the remainder, there was a residuum of one-fourth of the whole. There was also a small addition to the quantity of air after the first part of the process, but none after the second; nor could he, after a third and fourth process, render more than one-fourth immiscible with water. In two experiments, the residuum was inflammable, and burned with a blue flame.

With regard to the quantity of fixed air which may be expelled from different substances, Dr Priestley observes, that, from seven ounces of whiting, the purest calcareous substance we are acquainted with, he expelled by heat 630 ounce-measures of air; by which means the whiting was reduced to four ounces. One third of this was somewhat phlogisticated, the standard being 1.36 and 1.38. Repeating the experiment, he obtained 440 ounce-measures of air from six ounces of whiting; about one-half of which was fixed air, and the remainder of the standard of 1.4. On moistening some calcined whiting with water impregnated with vitriolic acid air, he obtained 90 ounce-measures; of which the first portions were three-fourths fixed air, and the standard of the residuum 1.5; the latter had less fixed air, and the standard of the residuum was 1.44. The whiting was rendered black and hard, but became soft and white with spirit of salt. Three ounces and a quarter of lime fallen in the air yielded 375 ounce-measures; of which about one-fifth was fixed air, and the standard of the residuum 1.4. Four ounces of white lead had yielded 240 measures of air when the retort melted. The residuum of the first process was one-third, the standard 1.36; and of the last the standard was 1.28, that with the common atmosphere being 1.23. Two ounces and three quarters of wood ashes yielded, in a very strong heat, 430 ounce-measures of air; of the first portion of which one-tenth, of the second one-third, and of the third one-half, was fixed air.

115
Effects of a
strong heat
on fixed air.

116
Quantity of
fixed air ex-
pelled from
different
substances.

Fixed Air. air. The standard of the residuum of the first portion was 1.6, and of the second 1.7. It extinguished a candle; so that the air came properly from the ashes, and not from any remaining particles of the charcoal mixed with them. After the process, the ashes weighed 839 grains; but by exposure to the air for one day, the weight was increased to 842 grains; and, perhaps with more heat than before, yielded 50 ounce-measures of air; of which about one-eighth was fixed air, and the standard of the residuum 1.38 and 1.41. A candle burned in this residuum, and the ashes were reduced to 789½ grains. Two ounce-measures of Homberg's pyrophorus burned in the open air, and then distilled in a retort, yielded 144 ounce-measures of air; of which one-half at first was fixed air, but at the last very little. The residuum of the first portion extinguished a candle, but that of the last burned with a blue lambent flame. The standards of both with nitrous air were about 1.8. The pyrophorus was then kept two days in the retort, with the mouth immersed in mercury; after which, on being taken out, it burned as strong as ever. Immediately before the burning, it weighed 428 grains; immediately after it, 449: but being spread thin, and exposed to the atmosphere for a night, the weight was increased to 828 grains; though, on being well dried, it was again reduced to 486. Subjecting it to a greater heat than before, the matter yielded 110 ounce-measures of air; the first portions of which were half fixed air, but the last contained very little, and burned with a blue lambent flame. It was then reduced to 396 grains. The experiment was then repeated with a quantity of pyrophorus, which would not take fire in the open air; and on heating this substance in an earthen retort, five-sevenths of the first part of the produce was fixed air: but this proportion gradually diminished; till at last nine-tenths of the whole was inflammable air, burning with a lambent blue flame. This inflammable air being decomposed with an equal quantity of dephlogisticated air, yielded 0.86 of a measure of fixed air. Another quantity of pyrophorus, which burned very well, and which, by exposure to the atmosphere, had gained 132 grains, being again exposed to heat in an earthen retort, gave 180 ounce-measures of air; three-sevenths of the first portion of which was fixed, and the rest phlogisticated air; but afterwards only one-half was fixed, and the rest inflammable, burning with a lambent blue flame; and at last it was wholly inflammable. This pyrophorus took fire again after being poured out of the retort, but not without the assistance of external heat. It had been red-hot through the whole mass at the first burning, and the surface was covered with white ashes; but all the inside was as black as ever it had been. Four ounces of dry ox-blood yielded 1200 ounce-measures of air, and it was conjectured that not less than 200 measures had escaped. It contained no fixed air. The first portion burned with a large lambent white flame, the middle portion fainter, and the last was hardly inflammable at all. The remaining coal weighed 255 grains, and was a good conductor of electricity.

SECT. VI. *Inflammable Air.*

WE owe the knowledge of the existence, and of some remarkable properties, of this air, to Mr Cavendish, by

whom they were first published in 1767. Its effects, however, had long before been fatally experienced by miners; in whose subterraneous habitations it is often collected in such quantities as to produce the most dreadful effects. It is produced in abundance from putrid animal and vegetable substances; and, in general, by all those which part with their phlogiston easily. Being much lighter than common air, it always rises to the top of those places where it is generated; so that it cannot be confined except in some vaulted place, but always strives to ascend and mix with the atmosphere. By itself it is very noxious, and will instantly put an end to animal life; but when mixed with atmospherical air, may be breathed in much greater quantity than fixed air. Its great inflammability in this state, however, renders it very dangerous to bring any lights, or even to strike a flint with steel, in those places where it abounds. But this only takes place when the inflammable air is mixed with common atmospherical or with dephlogisticated air; in which case, the explosion is much more violent than the former; for pure inflammable air extinguishes flame as effectually as fixed or phlogisticated air.

Besides the subterraneous places already mentioned, this kind of air is found in ditches; over the surface of putrid waters, out of which it escapes; in burying-places; in houses of office, where putrid animal and vegetable matters are accumulated; and may, by standing or boiling, be extracted from the waters of most lakes and rivers, especially those in which great quantities of fermenting and putrefying matters are thrown: and as putrefaction thus seems to be the principal source of inflammable air, it thence happens, that much more of it is produced in warm than in cold climates. In those countries, we are informed by Dr Franklin, that if the mud at the bottom of a pond be well stirred, and a lighted candle brought near to the surface of the water immediately after, a flame will instantly spread a considerable way over the water, from the ascension of the inflammable air, affording a very curious spectacle in the night-time. In colder climates, the generation of inflammable air is not so plentiful as to produce this phenomenon; nevertheless Mr Cavallo informs us, that it may be plentifully procured in the following manner, in all the ponds about London. "Fill a wide-mouthed bottle with the water of the pond, and keep it inverted therein; then, with a stick, stir the mud at the bottom of the pond, just under the inverted bottle, so as to let the bubbles of air which come out of it enter into the bottle; which air is inflammable. When by thus stirring the mud in various places, and catching the air in the bottle until this is filled, a cork or glass stopper must be put over it whilst standing in water; and then the bottle must be taken home, in order to examine the contained inflammable fluid at leisure."

The great quantity of inflammable air produced in warm climates has given occasion to some philosophers to suppose, that it may possibly have some share in producing certain atmospherical meteors. The weak lightnings without any explosion, which are sometimes perceived near the horizon in serene weather, are by them conjectured to proceed from inflammable air fired by electric explosions in the atmosphere. Mr Volta supposes that the *ignes fatui* are occasioned by the inflammable air which proceeds from marshy grounds,

Inflammable Air.

Inflammable air produced in mines from putrid waters, &c.

Great quantities produced in hot climates.

Mr Cavallo's method of collecting inflammable air from ponds.

Meteors thought to proceed from it.

Inflam-
ble Air.

grounds, and is set on fire by electric sparks: but these phenomena can be accounted for in a more probable manner from the action of the electric fluid itself.

121
Differences
among in-
flammable
airs.

This kind of air is more common than any of the other noxious airs; for there is hardly any inflammable substance on earth, out of which it may not be extracted by one means or other. The fluids, however, which go by the general name of *inflammable air*, have scarce any other property in common to them all, besides those of inflammability, and being specifically lighter than the common atmospherical air. In other respects, the differences between them are very considerable. The smell, weight, power of burning, of preserving their properties, and the phenomena attending their combustion, are by no means the same in them all; some burning in an explosive manner; others quietly, and with a lambent flame of a white or blue colour. It is, however, necessary to make a proper distinction between an inflammable elastic fluid or inflammable gas, which may be properly called so, and that which is evidently made by combining an inflammable substance with common air; which being easily separable from the air, leaves that fluid in the state it was before. Thus a drop of ether, put into a quantity of common air, mixes itself with it, and takes fire on the approach of flame, like a mixture of inflammable and common air; but, if the air to which ether is added be washed in water, the latter is soon separated from it. Common air becomes also inflammable by being transmitted through several essential oils; and thus the air contiguous to the plant called *fraxinella* becomes inflammable in calm and hot weather, by the emission of its inflammable air.

122
Extracted
from vari-
ous substan-
ces by heat

By heat alone, a considerable quantity of this kind of air may be extracted from most inflammable substances, and even from some of the metals. Dr Hales obtained inflammable air by simply distilling wax, pitch, amber, coals, pease, and oyster shells; and Mr Fontana informs us, that he obtained a considerable quantity of inflammable air from spathose iron, by the action of fire only applied to it in a matrafs. Dr Priestley, however, obtained it from a vast number of other substances, by distilling them in a gun-barrel; to the extremity of which was luted a tobacco-pipe, or small glass tube, with a flaccid bladder tied on the end. He observes, that the heat must be suddenly applied, in order to get a considerable quantity of air from these substances. "Notwithstanding (says he) the same care be taken in luting, and in every other respect, six, or even ten, times more air may be got by a sudden heat than by a slow one, though the heat that is last applied be as intense as that which was applied suddenly. A bit of dry oak, weighing about twelve grains, will generally yield a sheep's bladder full of inflammable air with a brisk heat, when it will only yield two or three ounce-measures if the same heat be applied gradually." When he wanted to extract inflammable air from metals, a glass was used, the focus of which afforded a more intense heat than any furnace he could apply: and in this way he obtained inflammable air from several metals; as iron, brass, and tin; but with the metallic calces he had no success.

123
More air
procured by
a sudden
than gra-
dual heat.

In the infancy of his experiments, and even after very considerable practice, the Doctor imagined, that

the inflammable air produced in this way came only from the metal, without attending to the share which water had in the production. Some late experiments of Mr Lavoisier, however, showed, that water had a great share in the production of inflammable air; info- much that it gave occasion to a supposition, that the water was the only source from whence it was derived. This mistake, however, was detected by Dr Priestley, who, by his numerous and accurate experiments, seems in a manner to have exhausted the subject. The method which Mr Lavoisier had followed, was to send the steam of boiling water through a red-hot iron tube; in doing which, the intense heat acquired by the water occasioned the production of a great quantity of inflammable air. Dr Priestley repeated his experiments not only with water, but with other fluids. Sending the vapour of two ounces of spirit of wine through a red-hot earthen tube, he obtained 1900 ounce-measures of inflammable air, which burned with a white lambent flame. It contained no fixed air; and 30 ounce-measures of it weighed eight grains less than an equal quantity of common air. He collected also 0.35 of an ounce-measure of water. In this experiment, the weight of the water collected was 168 grains, of the inflammable air 633 grains, and that of the spirit of wine originally was 821 grains; so that as little was lost in the process as could be expected.—Repeating the experiment with vitriolic ether, an ounce of it treated in the same manner in an earthen tube almost filled with pieces of broken earthen retorts and crucibles, one tenth part of an ounce of water was collected, and 740 ounce-measures of inflammable air were procured, without any mixture or fixed air, burning with a white lambent flame like that of wood, and not exploding with dephlogisticated air. Twenty-nine ounce-measures of this weighed five grains less than an equal quantity of common air. Vapour of spirit of turpentine yielded inflammable air mixed with much black smoke, which soon collected on the surface of the water in the receiver. The smell of this air was exceedingly offensive, and its flame was much less luminous than that of the former. Its specific gravity was the same with that of the air procured from spirit of wine. Olive oil yielded a considerable quantity of air on being mixed with calcined whiting; the first portions burning with a large white flame, and the last with a lambent blue one.

In extracting air from solid substances, the steam of water was always necessary; and thus inflammable air was produced from a great number of different ones. From sulphur treated in this manner in an earthen tube, inflammable air was obtained of a nature similar to that from oil of vitriol and iron. From arsenic, the produce was one-seventh of fixed air; but all the rest strongly inflammable, with a smell scarcely distinguishable from that of phosphorus. Twenty ounce-measures of this air weighed $4\frac{1}{2}$ grains less than an equal quantity of common air. Both these experiments, however, were very troublesome, on account of the volatility of the matters, which sublimed and choaked up the tubes. From two ounces of the scales of iron, or *fining cinder*, which he has found to be the same thing, Dr Priestley obtained 580 ounce-measures of air; one tenth of the first part of which was fixed air, but afterwards it was all inflammable.

Forty

Inflam-
ble Air.124
How pro-
cured from
water and
other fluid
and solid
substances.

Inflam-
mable Air.

Forty ounce-measures of this air weighed two grains more than an equal quantity of common air. From charcoal exposed to the red-hot steam of water, inflammable air was procured in great quantities. From ninety-four grains of perfect charcoal, that is, prepared with a strong heat so as to expel all fixed air from it, and 240 ounces of water, 840 ounce-measures of air were obtained, one-fifth part of which was fixed air; and the inflammable part appeared likewise, by decomposition, to have a quantity of fixed air intimately combined with it. Three ounces of bones burnt black, and treated in this manner in a copper tube, yielded 840 ounce-measures of air; the water expended being 288 grains, and the bones losing 110 grains of their weight. This air, he observes, differs considerably from that of any other kind of inflammable air; being in several respects a medium betwixt the air procured from charcoal and that from iron. It contains about one-fourth of its bulk of uncombined fixed air, but not quite one-tenth intimately combined with the remainder. The water that came over was blue, and pretty strongly alkaline; owing to the volatile alkali not having been totally expelled by the heat which had reduced the bones to blackness.

A variety of substances, said not to contain any phlogiston, were subjected to the same process, but without yielding any inflammable air. The experiments with iron, however, were the most satisfactory, as being subject to less variation than those with charcoal; and clearly evincing, that the air in the process does not come from the water alone, but from the iron also; or, as Dr Priestley says, "only from the iron; the weight of water expended, deducting the weight of air produced, being found in the addition of weight in the iron as nearly as could be expected in experiments of this kind. And though the inflammable air procured in this process is between one-third and one-half more than can be procured from iron by solution in acids, the reason may be, that much phlogiston is retained in the solutions; and therefore much more may be expelled from iron when pure water, without any acid, takes place of it. The produce of air, and likewise the addition of weight gained by the iron, are also much more easily ascertained in these experiments than the quantity of water expended in them; on account of the great length of the vessels used in the process, and the different quantities that may perhaps be retained in the worm of the tube.

125
Proportions of inflammable air obtained from iron by means of steam.

The following are the results of some of the Doctor's experiments.—Two hundred and sixty-seven grains, added to the weight of a quantity of iron, produced a loss of 336 grains of water, and an emission of 840 ounce-measures of air; and, in another experiment, 140 grains added to the weight of the iron produced a loss of 240 grains of water, and the emission of 420 ounce-measures of air. "The inflammable

air produced in this manner (says he) is of the lightest kind, and free from that very offensive smell which is generally occasioned by the rapid solution of metals in oil of vitriol; and it is extricated in as little time in this way as it is possible to do it by any mode of solution. The following experiment was made with a view to ascertain the quantity of inflammable air that may be procured in this manner from any given quantity of iron. Nine hundred and sixty grains of iron, when dissolved in acids, will yield about 800 ounce-measures of air; but, treated in this manner, it yielded 1054 measures, and then the iron had gained 329 grains in weight" (A).

Inflammable air having been at first produced only from metals by means of acids, it was then supposed that part of the acid necessarily enters into its composition; but this hypothesis is now found to be ill grounded. "That no acid (says Dr Priestley), is necessarily contained, or at least in any sensible quantity, either in inflammable air, though produced by means of acids, or in the dephlogisticated air of the atmosphere, is evident from the following experiment, which I made with the greatest care: Taking a basin which contained a small quantity of water tinged blue with the juice of turnsole, I placed it in a bent tube of glass, which came from a vessel containing iron and diluted oil of vitriol; and, lighting the current of inflammable air as it issued from this tube, so that it burned exactly like a candle, I placed over it an inverted glass jar, so that the mouth of it was plunged in the liquor. Under this jar the inflammable air burned as long as it could; and when extinguished for want of more pure air, I suffered the liquor to rise as high as it could within the jar, that it might imbibe whatever should be deposited from the decomposition of either of the two kinds of air. I then took off the jar, changed the air in it, and, lighting the stream of inflammable air, replaced the jar as before. This I did till I had decomposed a very great quantity of the two kinds of air, without perceiving the least change in the colour of the liquor, which must have been the case if any acid had entered as a necessary constituent part into either of the two kinds of air. I also found no acid whatever in the water, which was procured by keeping a stream of inflammable air constantly burning in a large glass balloon, through which the air could circulate, so that the flame did not go out. Neither was there any acid produced in the decomposition of inflammable and dephlogisticated air in a strong close glass vessel.

"With respect to inflammable air, I have observed, that when sufficient care is taken to free it from any acid vapour that may be accidentally contained in it, it is not in the smallest degree affected by a mixture of alkaline air. On the whole, therefore, I have at present no doubt, but that pure inflammable air, though it certainly contains water, does not necessarily contain any

(A) In these experiments, the Doctor seems not to have supposed that any particular kind of water was necessary for this production of inflammable air: but in the Memoirs of the Philosophical Society at Haerlem, it is asserted by Dr Deiman and M. Paets Van Troostwyk, that the experiment will not succeed when boiled or distilled water, or any other than that containing fixed air, is made use of; and to this air they attribute the calcination of the iron and production of inflammable air. This assertion, however, is contrary to what we find related by Mr Kirwan. See n^o 138.

Inflam-
ble Air.128
Water ne-
cessary to
its produc-
tion.129
Charcoal
totally con-
vertible in-
to inflam-
mable air.130
Weight of
ashes deri-
ved from
the air.131
Experi-
ment show-
ing the ne-
cessity of
water to
the produc-
tion of in-
flammable
air.

any acid: yet an acid vapour may be easily diffused through it, and may perhaps, in many cases, be obstinately retained by it, as no kind of air seems to be capable of so great a variety of impregnations as inflammable air is."

Mr Cavendish first perceived the necessity of moisture to the production of inflammable air; but it was not until after making several experiments that Dr Priestley could adopt the same idea. He had observed some very remarkable circumstances relating to the production of inflammable air from charcoal, by which he was induced to suppose that the former was pure phlogiston in a volatile state without any moisture whatever. The Doctor observes, that "charcoal is generally said to be indestructible, except by a red heat in contact with air. But I find (says he), that it is perfectly destructible, or decomposed, *in vacuo*, and, by the heat of a burning lens, almost convertible into inflammable air; so that nothing remains besides an exceedingly small quantity of white ashes, which are seldom visible, except when in very small particles they happen to cross the sun-beams as they fly about the receiver. It would be impossible to collect or weigh them; but, according to appearance, the ashes thus produced, from many pounds of wood, could not be supposed to weigh a grain. The great weight of ashes produced by burning wood in the open air arises from what is attracted by them from the air. The air which I get in this manner is wholly inflammable, without the least particle of fixed air in it. But in order to this, the charcoal must be perfectly well made, or with such a heat as would expel all the fixed air which the wood contains; and it must be continued till it yield inflammable air only, which, in an earthen retort, is soon produced.

"Wood or charcoal is even perfectly destructible, that is, resolvable into inflammable air, in a good earthen retort, and a fire that would about melt iron. In these circumstances, after all the fixed air had come over, I several times continued the process during a whole day; in all which time inflammable air has been produced equably, and without any appearance of a termination. Nor did I wonder at this, after seeing it wholly vanish into inflammable air *in vacuo*. A quantity of charcoal made from oak, and weighing about an ounce, generally gave me about five ounce-measures of inflammable air in twelve minutes."

Although from these experiments it did not appear that water was in any way essentially necessary to the production of this kind of inflammable air, it appeared manifestly to be so in the following: "At the time (says he) when I dispersed any quantity of charcoal with a burning lens *in vacuo*, and thereby filled my receiver with nothing but inflammable air, I had no suspicion that the wet leather on which my receiver stood could have any influence in the case, while the piece of charcoal was subject to the intense heat of the lens, and placed several inches above the leather. I had also procured inflammable air from charcoal in a glazed earthen retort for two whole days successively, during which it continued to yield it without intermission. Also iron-filings in a gun-barrel, and a gun-barrel itself, had always given inflammable air whenever I tried

the experiment. These circumstances, however, deceived me, and perhaps would have deceived any other person; for I did not know, and could not have believed, the powerful attraction between water and charcoal of iron, when the latter are intensely hot. They will find, and attract it, in the midst of the hottest fire, and through any pores that may be left open in a retort; and iron-filings are seldom so dry as not to have as much moisture adhering to them as is capable of enabling them to give a considerable quantity of inflammable air. But my attention being now fully awakened to the subject, I presently found that the circumstances above mentioned had actually misled me; I mean with respect to the conclusion which I drew from the experiments, and not with respect to the experiments themselves, every one of which will, I doubt not, be found to answer, when properly tried.

"Being thus apprised of the influence of unperceived moisture in the production of inflammable air, and willing to ascertain it to my perfect satisfaction, I began with filling a gun-barrel with iron-filings in their common state, without taking any particular precaution to dry them, and I found that they gave air as they had been used to do, and continued to do so many hours: I even got ten ounce-measures of inflammable air from two ounces of iron-filings in a coated glass retort: At length, however, the production of inflammable air from the gun-barrel ceased; but, on putting water to it, the air was produced again; and a few repetitions of the experiment convinced me that I had been too precipitate in concluding that inflammable air is pure phlogiston. I then repeated the experiment with the charcoal, making the receiver the stand on which I placed the charcoal, and the charcoal itself, as dry and hot as possible, and using cement instead of wet leather, in order to exclude the air. In these circumstances I was not able, with the advantage of a good sun and an excellent burning lens, to decompose quite so much as two grains of the piece of charcoal which gave me ten ounce-measures of inflammable air; and this, I imagine, was effected by means of so much moisture as was deposited from the air in its state of rarefaction, and before it could be drawn from the receiver. To the production of this kind of inflammable air, therefore, I was now convinced that water is as essential as to that from iron."

In his analysis of different kinds of inflammable air, the Doctor observes, that the difference most commonly perceived is, that some of them burn with a lambent flame, sometimes white, sometimes yellow, and sometimes blue; while another kind always burns with an explosion, making more or less of a report when a lighted candle is dipped into a jar filled with it. The inflammable air extracted from metals by means of acids is of this last kind; and that from wood, coal, or other inflammable substances by means of heat, belongs to the former. It has also been observed, that these kinds of inflammable air have different specific gravities; the purest, or that which is extracted from iron, &c. being about ten times as light as common air; but some of the other kinds not more than twice as light (A).

This difference was for some time attributed to a quantity

(A) Here the Doctor's calculation differs somewhat from that of Mr Kirwan; who, in his Treatise on Phlogiston,

Sect. VI.

A E R O L O G Y.

Inflam-
ble Air.Inflam-
ble Air.

quantity of fixed air intimately combined with the heavier kinds, so that it could not be discovered by lime-water, while the lightest contained no fixed air at all. In order to ascertain this point, he had recourse to decomposition; which was performed by mixing with the inflammable air to be tried an equal quantity of common or dephlogisticated air, and then confining them in a strong glass vessel previously filled either with water or mercury; making afterwards an electric spark in some part of the mixture by means of wires inserted through the sides of the vessel, and nearly meeting within it. Thus he supposed that he might be able to determine the quantity of *combined* fixed air, and likewise the relative quantity of phlogiston contained in each of them. The former appeared by washing the air with lime-water after the explosion, and observing how much of them was observed; and the latter by examining the residuum with the test of nitrous air, and observing the purity of it. Finding, however, that, in some cases, more fixed air was found after the explosion than could have been *contained* in the inflammable air, he was thence led to observe the *generation* of fixed air from the principles mentioned in the last section.

135
Fixed air
generated
in the de-
composition
of in-
flammable
air.

In prosecuting this subject, it was found, that one measure of inflammable air produced by steam from metals, and one of dephlogisticated air, such as by mixture with two measures of nitrous air was reduced to 0.72 of a measure, were reduced by explosion to 0.6 of a measure; the residuum, by an equal quantity of nitrous air, was reduced to 0.87. With the same dephlogisticated air, the inflammable air from fining-cinder and charcoal was reduced only to 1.85 of a measure; but by washing in lime-water, to 1.2. The residuum examined by nitrous air appeared to be of the standard of 0.9. In another process, the diminution after the explosion was to 1.55, and that after washing in lime-water to 0.65 of a measure; in a third, by explosion to 1.6, and by washing to 0.66; and in a fourth, the first diminution was to 1.6, and the second to 0.6. In this last experiment there was a generation of an entire measure of fixed air; and that this had not been contained originally in any latent state in the original fluid, was evident from the specific gravity of the inflammable air made use of. This, indeed, was one of the heaviest kinds of the fluid: but 40 ounce-measures of it weighed only two grains more than an equal bulk of common air; whereas, had all the fixed air found in the residuum been *contained* in the original air, it must have been at least one-half heavier. "Indeed (says the Doctor) if any quantity of inflammable air, of about the same specific gravity with common air (which is the case with that species of it I am now considering), yield so much as seven-tenths of its bulk of fixed air in consequence of its explosion with dephlogisticated air, it is a proof that at least part of that fixed air was generated in the process, because seven-tenths of such fixed air would weigh more than the whole measure of inflammable air."

Equal parts of dephlogisticated air and the inflammable kind produced from spirit of wine, were reduced to one measure, and by washing in lime-water to 0.6 of a measure. The standard of the residuum was 1.7.—In another experiment, in which the vapour of the spirit of wine had passed through a tube filled with bits of crucibles, the first diminution was to 1.6, the second to 1.4, and the standard of the residuum was to 1.84; but in a third, the first diminution was to 1.2, the second to 0.9.—Air procured by steam from red-hot platina was reduced to 0.72 of a measure, and the standard of the residuum was 0.9. It contained no fixed air.—Air from brimstone, with an equal part of dephlogisticated air, was diminished to 0.6, and no fixed air was found in the residuum. Its standard was 0.95.—With inflammable air from arsenic, the first reduction was to 1.15, the second to 0.95. The standard was 0.82.—With the inflammable air procured by a decomposition of alkaline air, the diminution by explosion was to 0.96, and no fixed air was contained in the residuum; the standard of which was 0.8.—Inflammable air from ether resembles that from spirit of wine. The first diminution was to 1.36, the second to 1.2; and the standard was 1.9.

Inflammable air procured by means of steam from charcoal of metals produces a considerable quantity of fixed air; the first diminution being to 1.12, the second to 0.8, and the standard of the residuum 1.9. This analysis was of the first portion that came over, the second was somewhat different; the first diminution being to 1.0, the second to 0.75, and the standard of the residuum 1.9.—From *coak*, or the charcoal of pitcoal, the first diminution was to 1.15, the second to 0.95, and the standard 1.9; but the dephlogisticated air in this experiment was by no means pure.

With inflammable air from spirit of turpentine, the first diminution was to 1.7, the second to 1.6, and the standard 1.9.—From bones, the first diminution was to 0.67, the second to 0.58; the standard 1.47.—From common charcoal, the first diminution was to 1.5, the second to 0.74, and the standard 1.7. In another experiment, the first diminution was to 0.82, the second to 0.63, and the standard of the residuum 1.37.

Inflammable air procured by distilling some rich mould in a gun-barrel had a very offensive smell, like that procured from putrid vegetables; it contained one-twentieth part of uncombined fixed air. When this was separated from it, and the remainder decomposed with dephlogisticated air, the first diminution was to 1.4, the second to 0.67, and the standard of the residuum was 0.6.—The air procured from cast-iron has likewise a peculiarly offensive smell; and, on this account, the Doctor imagined, that it might contain more phlogiston than common inflammable air, so as to absorb more dephlogisticated air than the other. But this conjecture did not appear to be well founded; for, on exploding it with dephlogisticated air in the proportions

giston, informs us, that in his experiments he used "inflammable air extracted from clean newly-made filings of soft iron, in the temperature of 59°, by vitriolic acid, whose specific gravity was 1.0973, and obtained over mercury, having very little smell, and what it had being very unlike the usual smell of inflammable air."—The weight of this air, when the barometer stood at 29.9, and the thermometer at 60°, was found to be to that of common air as 84.3 to 1000; and, consequently, near 12 times lighter.

Inflam-
mable Air.

proportions already mentioned, the diminution was the same as with inflammable air produced from the malleable kind, viz. 1.56.

136
Fixed air
convertible
into inflam-
mable air.

In these experiments, it seemed evident, that at least part of the fixed air found after the explosion was produced by its means; but the following seem no less convincing proofs, that fixed air may be converted into the inflammable kind, or at least that the elements of fixed air may remain in inflammable air in such a manner as to be imperceptible. On heating in an earthen retort a quantity of slaked lime, which had long been kept close corked in a bottle, it gave air, of which one-fifth was generally fixed air; but in the gun-barrel the same lime yielded no fixed air at all, but a great quantity of inflammable air of the explosive kind, like that which is got from iron alone by means of water. As this total disappearance of the fixed air appeared extraordinary, the Doctor was induced to repeat it several times with all possible care; and the following was the result of his experiments: Three ounces of slaked lime, which had for some time been exposed to the open air, heated in an earthen tube, yielded 14 ounce-measures of air, of which only two and an half remained unabsorbed by water; the residuum was slightly inflammable, but not perfectly phlogisticated. Three ounces of the same lime, heated in a gun-barrel, gave 20 ounce measures of air, all of which was inflammable, and no part fixed. It was expected, however, that the fixed air would have appeared on the decomposition of this inflammable air with the dephlogisticated kind: but after this process, it appeared to be exactly such inflammable air as is procured from metals by the mineral acids, or by steam; the diminution of the two kinds of air being exactly the same: and tho' some fixed air was found in the residuum, it was no more than is usually met with in the decomposition of inflammable air procured by means of spirit of salt.—Supposing that the two kinds of air might incorporate, when one of them was generated within the other, a gun-barrel was filled with fixed air, and the closed end of it put into a hot fire. Inflammable air was instantly produced; but when the fixed air was separated from it, it burned like inflammable air with which no other kind had ever been mixed.

On heating iron-turnings in five ounce-measures of fixed air, the quantity of it was increased about one ounce measure, and there remained one and three-fourths unabsorbed by water. The experiment was repeated with the same result; and it was farther observed, that though the inflammable air procured in this manner did not appear by the test of lime-water to contain any fixed air, yet when it was decomposed by firing it with an equal quantity of dephlogisticated air, the residuum contained one-third of fixed air. The diminution was to 1.45. Hence the Doctor conjectures, that though, in some cases, the fixed air appears to be generated by the decomposition of dephlogisticated and inflammable air, yet that inflammable air, when thus produced in contact with fixed air, may combine with it, so as to be properly contained in it, and in such a manner that it cannot be discovered by lime-water.

Inflammable air, when produced in the driest way possible, is exceedingly light, as has been already observed; but Dr Priestley has found, that, by standing

on water, a very considerable increase is made in its specific gravity; so that from being ten or twelve times lighter than atmospherical air, it soon becomes only seven times lighter. This great propensity to unite with water is also taken notice of by Mr Kirwan; who tells us, that the bulk of inflammable air obtained over water with the assistance of heat towards the end, was one-eighth greater than when produced over mercury; but that the weight of it in the former case was only eight or nine times less than common air.—“From 85 cubic inches of inflammable air obtained over water, I extracted,” says he, “by oil of vitriol exposed to it for 55 hours, two grains of water; and, though undoubtedly there is an error in all these experiments, yet there can be little doubt but this inflammable air contained one-half its weight of water. The inflammable air, by the subtraction of its water, lost its smell, but continued as inflammable as ever; and therefore there is no reason to think that it was decomposed, or that water is any way essential to it.”

This conclusion is directly contrary to that of Dr Priestley, that water is an essential ingredient in the composition of inflammable air; nor do the experiments of the latter, already recited, seem to have had any weight with him, as he concludes his Treatise on Phlogiston in these words; “To the proofs I have heretofore given, that inflammable air and phlogiston are the same substance, just as ice and the vapour of water are called the same substance, no objection of any weight has since been made. Some have thought that I should have included the matter of heat or elementary fire in the definition of inflammable air; but as fire is contained in all corporeal substances, it is perfectly needless, except where bodies differ in the quantity of it they contain; and in this respect I expressly mentioned its difference with phlogiston to consist.—Others, attending to the quantity of water contained in inflammable air, have supposed it to be an essential ingredient in the composition of this air, and have called it *phlogisticated water*; but they may as well suppose water to be an essential ingredient in common air, or fixed air, and call this last *acidulated water*; for inflammable air, equally as other airs, may be deprived of its water without any limitation, and yet preserve all its properties unaltered; which shows the presence of water to be no way essential to it. Lastly, others have thought, that it essentially requires an acid or an alkali, or some saline substance, for its basis; as if there were any more repugnance in the nature of things, that phlogiston should exist in an aerial state without any basis, than marine air, alkaline air, or dephlogisticated air; when it is evident, that an aerial state requires no more than a certain proportion of latent heat; but the production of inflammable air from iron by means of distilled water, without any acid or salt, has effectually done away any suspicion of that sort.”

On the other hand, Dr Priestley informs us, that “inflammable air seems now to consist of water and inflammable air; which, however, seems extraordinary, as the two substances are hereby made to involve each other; one of the constituent parts of water being inflammable air, and one of the constituent parts of inflammable air being water; and therefore, if the experiments would favour it (but I do not see that they do so),

137
Great propen-
sity of
inflammable
air to
unite with
water.138
Mr Kir-
wan's con-
clusion con-
cerning the
principles
of inflam-
mable air.139
Dr Priest-
ley's con-
clusion.

Inflam-
mable Air.Inflam-
mable Air.

so), it would be more natural to suppose, that water, like fixed air, consists of phlogiston and dephlogisticated air, in some different mode of combination.

"There is an astonishing variety in the different kinds of inflammable air, the cause of which is very imperfectly known. The lightest, and therefore probably the purest kind, seems to consist of phlogiston and water only. But it is probable that *oil*, and that of different kinds, may be held in solution in several of them, and be the reason of their burning with a lambent flame, and also of their being so readily resolved into fixed air when they are decomposed by dephlogisticated air; though why this should be the case, I cannot imagine.

"When inflammable and dephlogisticated air are burned together, the weight of the water produced is never, I believe, found quite equal to that of both kinds of air. May not the *light*, therefore, emitted from the flame, be part of the phlogiston of the inflammable air united to the principle of heat? And as light accompanies the *electric spark*, may not this also be the real *accension* of some phlogistic matter, though it is not easy to find the source of it?"

The French chemists, who deny the existence of phlogiston, are of opinion, that inflammable air is a simple uncompound element; but for a more full discussion of this subject, see the article PHLOGISTON.

140
Absorption
of inflam-
mable air
by water.

Inflammable air is absorbed by water in considerable quantity, but by the application of heat may be expelled again in equal quantity. By agitation in water Dr Priestley was formerly of opinion that this kind of air might be rendered as good as common air; but this undoubtedly proceeds from the atmospherical air transmitted by the water, as is the case with phlogisticated air mentioned in the last section. After a quantity of water, which had absorbed as much inflammable air as it could, had been suffered to stand a month, it was expelled by heat, and found to be as strongly inflammable as ever. The water, after the process, deposited a kind of filmy matter; which he supposed to be the earth of the metal that had been employed in producing it.

141
Its effects
on vegeta-
tion and
animal life.

Plants in general grow tolerably well in inflammable air, and the willow plant has been observed to absorb great quantities of it. Its inflammability is not diminished by the putrefaction of animal substances, nor does their putrefaction seem to be retarded by it. Animals confined in it are killed almost as soon as in fixed air: but insects, which can live a considerable time in phlogisticated air, live also a considerable time in this kind of air; but at last they become torpid, and appear to be dead, though they will still recover if removed into the open air. Mr Cavallo relates, that the Abbé Fontana, having filled a large bladder with inflammable air, began to breathe it in his presence; after having made a very violent expiration, in which case the effects are most powerful. The first inspiration produced a great oppression in his lungs, the second made him look very pale, and the third was scarce accomplished when he fell on his knees through weakness. Birds and small quadrupeds, inclosed in small vessels of this air, died after a very few inspirations. Lastly, inflammable air appears to have a smaller share of refractive power than common air; for Mr Waltire informs us, that having placed an hollow triangular prism, of which the

142
Has little
refractive
power.

VOL. I. Part I.

angle was 72 degrees, so as to half cover a large object-glass in one of Mr Dollond's perspectives, and so turned round as to make the frame of a window, at the distance of 1280 feet, seen partly through the prism and partly through common air, appear undivided. The inflammable air was then blown out of the prism, but no part of the apparatus was moved; when the frame of the window seen through the object-glass and the prism as before, seemed to separate about four inches.

The inflammability of this species of air has given occasion to various projects concerning it; such as that of employing it to give light and heat; and lamps have been described, which may be lighted by the electric spark in the night-time. By its means also very pretty artificial fires are made, with glass tubes bent in various directions, and pierced with a great number of small apertures. The inflammable gas is introduced into these tubes, from a bladder filled with that fluid, and fitted with a copper cock. When the bladder is pressed, the inflammable air, being made to pass into the tube, issues out of all the small apertures, and is set on fire by a lighted taper. None of these contrivances, however, have ever been applied to any use; and the scheme of Mr Volta, who proposed to substitute its explosive force instead of gun-powder, is found insufficient, on account of the weakness of the explosion, except when the two airs are fired in very great quantity, which would be incompatible with the small bulk necessary for warlike engines.

143
Schemes to
employ it
for various
purposes.

SECT. VII. Sulphurated Inflammable Air.

THIS was discovered by Dr Priestley at the time when he was engaged in the experiments of which some account has been given in the last section, of transmitting the steam of water and other fluids through red-hot tubes containing some solid material. Having, among others, treated manganese in this manner, by stopping one end of the heated tube with a cork before the steam was applied, he received forty ounce-measures of air, of which one-sixth was fixed air and the rest of the standard of 1.7, lambently inflammable. Having then opened the other end of the tube in order to admit the steam, air was produced more copiously than before. Of 50 ounces of this air, one-seventh was fixed, and the rest, of the standard of 1.8, explosively inflammable. The last portions were very turbid: and the smell, especially that of the last portion, was very sulphureous, tinging the water of a very dark colour, by depositing in it a quantity of blackish water. However, the air itself became presently transparent, and had no other appearance than that of any other kind of air. On looking at the jar in about ten minutes after, it was quite black and opaque; so that nothing could be seen in the inside of it. Filling afterwards another jar with the same kind of air, in order to observe the progress of this uncommon phenomenon, he found, that when the water was well subsided, black specks began to appear in different places, and, extending themselves in all directions, at length joined each other, till the whole jar was become perfectly black, and the glass opaque. When this was done, he transferred the air into another jar; and it soon produced a similar effect upon this, though it never became

144
First pro-
cured from
manganese.

Z

fo

Inflam-
mable Air.

so black as the jar in which it had been first received. It also frequently happened, that only the lower part of the jar would become black, as if the matter with which it was loaded had kept subsiding, though invisibly, in the mass of air, and occupied only the lower regions, leaving the upper part entirely free from it. On exposing to the open air the vessels thus turned black, the colour presently disappeared, and a yellow or brown incrustation was left upon it. The same change took place when the vessels were inverted in water, in order to observe the alteration of the air within them; but on examining this air, no sensible change was perceived. In some cases, indeed, he thought the air was injured, but it was much less so than he had expected. After depositing the black matter, the air still retained its sulphureous smell, and he did not imagine that it would ever leave it entirely.

145
Procured
from iron
melted in
vitriolic
acid air.

On trying other specimens of manganese, no air of this kind was obtained; but some time after, having occasion to make a large quantity of inflammable air, he used, instead of fresh iron, some that had been already melted in vitriolic acid air. Dissolving this with a considerable quantity of fresh metal in diluted vitriolic acid, he found that the water in which the air was received became very black, and deposited more sediment than had appeared in the experiment with the manganese. The jars were as black as ink, but became yellow on exposure to the air as before; so that there could be no doubt of its being the same thing he had got before. On burning a quantity of it, this kind of air appeared to contain some vitriolic acid, the balloon being filled with a very dense white fume, which rendered the water sensibly acid to the taste. On decomposing it with dephlogisticated air, however, he found the diminution exactly the same as when common inflammable and dephlogisticated air were used; so that it appeared to contain neither more nor less phlogiston than the other; only there was a small quantity of fixed air produced, which is never the case with common inflammable air from vitriolic acid and iron.

When the sulphurated inflammable air is received over mercury, very little black matter is produced on the jars; and it is remarkable, that though the black matter collected on them, when the air is taken through water, soon grows yellow upon exposing it to the air, it is not the case with that which remains in the water; it adheres to the evaporating vessel in form of a black incrustation, which does not burn blue until it has been digested in the nitrous acid, which deprives it of its superfluous phlogiston, and leaves it both of the colour and smell of sulphur.

SECT. VIII. *Of Alkaline Air.*

This was procured by Dr Priestley, in the beginning of his experiments, from common spirit of sal-ammoniac with quicklime, or the materials from which it is made. He did not at that time prosecute the discovery farther than by impregnating water with it; by which means he could make a much stronger alkaline spirit than any to be met with in the shops. His method of procuring it was by mixing one part of pounded sal-ammoniac with three parts of slacked lime; and for common experiments the same quantity of materials would last a considerable time.

This kind of air, when pure, is instantly fatal to animal life, and extinguishes flame; though, when mixed with common atmospherical air, it is slightly inflammable, and also medicinal in faintings and other cases of debility. A candle dipped into a jar of this air is extinguished; but just before the flame goes out, it is enlarged by the addition of another flame of a pale yellow colour, and sometimes a weak flame spreads for a considerable way, or even through the whole body of the alkaline air. The electric spark taken in it appears of a red colour. Every spark taken in it augments its bulk, and by degrees turns the whole into inflammable air. It is readily absorbed by water, as has been already observed, and dissolves ice almost as fast as an hot fire. On confining some water impregnated with alkaline air in a glass tube, and thus exposing it to a strong heat in a sand-furnace for some days, he observed that a white sediment or incrustation was formed on the surface. The Doctor remarked, that bits of linen, charcoal, and sponge, admitted into a quantity of alkaline air, diminished it, and acquired a very pungent smell; especially the sponge, a bit of which, about the size of an hazle-nut, absorbed an ounce-measure. It is remarkable that copper, which is so easily corroded by the common volatile alkalis, is not affected by alkaline air. The specific gravity of this kind of air is, by Mr Kirwan, determined to be to that of common air as 600 to 1000; though, as he justly observes, this must differ very considerably according to the quantity of moisture it contains.

Alkaline
Air.146
Properties
of alkaline
air.

In prosecuting his experiments on alkaline air, Dr Priestley concluded that it contains phlogiston, both from its being convertible into inflammable air by electric explosions, and likewise from its reviving the calces of metals. In attempting to ascertain the quantity of lead revived in alkaline air, he met with two difficulties; the first, on account of some part of the calx being blackened and imperfectly revived; the second, that the lead completely revived was dissolved by the mercury employed to confine the air. To prevent this last inconvenience, he put the powdered massicot (the substance he chose to employ on this occasion) into small earthen cups, contriving to place them with their mouths upwards, in such a manner, that when the lead was revived by means of a burning lens, it would remain in the cup, and not mix with the mercury which supported it. The proportions of metal then revived, were six grains of lead in three ounce-measures, $16\frac{1}{2}$ in three measures and an half, 13 in two and an half, and 12 in three and three-fourths; but the experiment on which he laid the greatest stress, was that in which $26\frac{1}{2}$ grains of lead were revived in $7\frac{1}{2}$ ounce-measures of alkaline air. In this proportion, 100 ounce-measures of alkaline air would revive 352 grains of lead; but an equal quantity of inflammable air from iron would have revived 480 grains of metal. This deficiency appeared somewhat surprising to the Doctor, considering that alkaline air is resolved into more than twice its bulk of the inflammable kind; though it is possible, that inflammable air from iron may contain more phlogiston than that into which alkaline air is resolvable.

147
Proofs of
its contain-
ing phlo-
giston.

On heating red precipitate in alkaline air, the mercury was revived as in other cases, and a considerable quantity of water was produced, though none appears

on

Alkaline Air. 146
on reviving it with common inflammable air. "It has even (says he) run down in drops in the inside of a vessel which contained five ounce-measures of the air; and a considerable quantity of dephlogisticated air was found on the residuum." On throwing the focus of the lens on red precipitate, inclosed in this kind of air, till three measures of it were reduced to two, water was produced as usual, and the standard of the residuum was 1.7. In another experiment, a violent explosion took place before he could observe whether any water was produced or not.

148
Conversion of alkaline into inflammable air.
In examining the phenomena which attend the conversion of alkaline air into the inflammable kind, the Doctor was induced to believe that it was occasioned by heat alone, without the concurrence of light. The effects of the former were first perceived on heating some ochre of iron in alkaline air; when, though the matter turned black, as in an incipient reduction of the metal, he found a considerable increase of quantity instead of decrease in the air, as he had expected; and, on examining the quality of it, he found that it contained no fixed air, but was entirely inflammable. With scales of iron a similar enlargement was perceived; but in this way he could never increase the quantity to more than double that which had been originally employed, and even after this the whole smelled strongly of volatile alkali; the iron had undergone no change.

The Doctor now, concluding from these experiments that the change of alkaline into inflammable air was produced by this cause alone, proceeded to repeat the experiment, by heating in the alkaline air bits of dry crucibles, or of earthen retorts, which had been just before exposed to very great heats, so that they could not be supposed to give out any air themselves, and therefore could only serve to communicate a strong heat to the alkaline air; and in these experiments the result was the same as when ochre and iron were made use of. The bits of white earthen ware were always turned black; but finding the same effect of augmenting the air and giving it an inflammable quality, though he used the bit of crucible over and over again, he was thoroughly convinced that the change was effected by heat alone.

In all these experiments, however, with a burning-glass, as a strong light was also concerned, he heated a quantity of alkaline air in a green glass retort, receiving in a glass tube, filled with water, all the air that could be expelled from it by heat. At first it was all absorbed by the water, being merely alkaline air expelled by the rarefaction; but when the bulb of the retort became red-hot, he found that the bubbles driven out were not wholly absorbed, and at last none of them were so. These were altogether inflammable; so that no doubt remained of the change being produced by heat alone, without any intervention of light.

It was farther observed, that whenever the alkaline air was changed into inflammable by means of bits of retorts or crucibles containing clay, they always became black during the process. He inclined therefore to suppose, that something might be deposited from the air which might attach itself to the clay. "Indeed (says he), if this was not the case, I do not see why the clay should become black; though, perhaps, part of the same phlogiston which forms the inflammable air may be attracted by the red-hot clay, with-

out there being any proper decomposition of the air. Nitrous Air. 149
That this is the case seems probable from an experiment in which I used porcelain instead of common earthen ware; which did not become black in the process, though inflammable air was produced."

149
In some of Dr Priestley's experiments, he had observed that iron, which had long rusted in nitrous air, gave out a strong smell of volatile alkali. This extraordinary phenomenon, however, was only perceived where the nitrous air and iron had been in contact for a very long time; but he found that it was much sooner produced by making use of a weak solution of copper; by putting iron into which he obtained that species of nitrous air called *dephlogisticated*. A phial containing some of this iron, which had been used only once for the purpose just mentioned, having been kept close corked for about two months, was accidentally broken; when some pieces of the iron were found covered with a green crust, and these had a strong smell of volatile alkali. On making some more experiments on this subject, he found that two months standing was requisite to produce the alkaline smell desired.

SECT. IX. Of Nitrous Air.

150
This kind of air is plentifully obtained in all cases where the nitrous acid is combined with phlogiston; How produced.
Thus, when it is mixed with metals, or animal or vegetable substances, nitrous air is produced in great quantities; but very sparingly when treated with metallic calces, earths, or other matters which are said to contain little or no phlogiston. All the metals, excepting gold, platina, and regulus of antimony, which are not soluble in the pure nitrous acid, yield nitrous air on being treated with it; and even from these, when dissolved in aqua regia, some quantity of this air may be obtained. Every metal, however, does not yield it in equal quantity, with equal facility, or equally good. Silver, copper, iron, brass, bismuth or nickel, when put into nitrous acid, yield this air in considerable quantity: Mercury yields this but slowly without the application of heat, though no great degree of it is necessary. Copper and iron, especially the latter, require the acid to be cautiously applied on account of the violent emission of fumes. Gold, platina, and regulus of antimony, when put in aqua regia, yield nitrous air pretty readily; but lead yields it in smaller proportion than any other metal, and zinc does the same among the semimetals, the elastic fluid produced from it being mostly phlogisticated air.

151
In the production of this kind of air, great differences are perceived by a diversity in the strength of the acid. Thus, if we dissolve copper in strong nitrous acid, no nitrous air is produced, though the same materials will yield air in great quantity by the mere affusion of water to dilute the acid. This is very properly explained by Doctor Priestley, from the property that the nitrous acid has of attracting phlogiston, which is evident from what happens in the solution of mercury. When strong spirit of nitre is poured upon this metal, the solution soon begins, and is very rapid, yet not a single bubble of elastic fluid is produced; but in a short time the acid next to the mercury is changed of an orange colour, which is an indication of its having acquired phlogiston, probably from the nitrous air.

Nitrous Air air which is decomposed the moment it is formed, and before its particles are united into visible bubbles. The bubbles of air indeed break through the coloured acid, but they disappear the moment they come in contact with the pale-coloured acid. As soon as the whole quantity of acid has assumed the orange colour, nitrous air escapes from it in considerable quantity; but the mixture of water deprives the acid of its power of the decomposing nitrous air. The strong and pale-coloured nitrous acid ought to be diluted with at least two or three parts of water to one of the acid, for the easy production of nitrous air from copper and mercury.

In common experiments, no other degree of heat is necessary than that produced by the effervescence itself, except mercury be used, which requires the application of some degree of heat; but when the metal exposes a very great surface to the acid, as is the case when the filings of the metal are used, the effervescence and production of nitrous air are often much quicker than can be conveniently managed. The most proper method of producing nitrous air, however, is explained in the last section of this treatise.

152
Properties
of nitrous
air.

Nitrous air by itself is equally transparent and invisible with common air, excepting at its first production, when it is somewhat coloured, owing to a little superfluous nitrous acid, or to some earthy particles which are carried up with it. Its smell resembles that of nitrous acid, or indeed is the very same; because, in passing through the common air to our nostrils, it is decomposed, and converted into nitrous acid. The same is to be said of its taste; though Mr Fontana, who tasted it without any contact of external air, affirms that it has no taste whatever. The method in which he ascertained this fact was as follows. Having first introduced the nitrous air into a bottle of elastic gum in water, as is done with glass bottles, he brought his mouth, shut, while the neck of the elastic-gum bottle was under water, near the neck of it; and then, by pressing the bottle, introduced the nitrous air into his mouth. The experiment, however, is by no means void of danger; for if the person happens to draw any quantity of this air into the lungs, he may be nearly suffocated, as nitrous air is exceedingly noxious. In performing of it, he recommends to exhaust the mouth entirely of common air, though he does not inform us how this can be done; nor indeed is it easy to conceive the possibility of doing so.

Though nitrous air extinguishes flame, it may by certain processes be brought into such a state that a candle will burn in it with an enlarged flame; and it becomes what Dr Priestley calls *dephlogisticated nitrous air*, which is treated in the next section. It is remarkable, however, that when a candle is extinguished, as it never fails to be in common nitrous air, the flame seems to be a little enlarged about its edges by the addition of another bluish flame before the former goes out.

153
Extremely
fatal to ani-
mal and ve-
getable life.

Nitrous air seems to be the most fatal to animal life of any. Even insects, which can bear phlogisticated and inflammable air, generally die the moment they are put into it. Frogs, snails, and other animals which do not respire very frequently, die in a few minutes, and generally do not recover even when taken out of this noxious fluid before they are dead. Plants

perish very soon in nitrous air, and even in common air saturated with nitrous air; but Dr Priestley informs us, that "though in general plants die almost immediately in water impregnated with nitrous air, yet, in one case of this kind, when the superfluous nitrous air was let out under water, so that no part of it was decomposed in contact with the water, the plant grew in it remarkably well."

Water, by agitation in nitrous air, may be made to imbibe one tenth part of its bulk; and afterwards the nitrous air may be expelled again by boiling, though not in the same quantity as it was absorbed; but for this purpose the water should be previously deprived of its air. Dr Priestley informs us, that having carefully pumped all the air out of a quantity of rain-water, letting it stand 24 hours in a good vacuum, and then impregnating it with nitrous air, he instantly expelled it again by boiling, when he obtained only about one fourth part of it, though sufficiently pure, and without any mixture of fixed air. Water may also be deprived of the nitrous air it contains, though it does not freeze quite so readily when impregnated with this air as in its natural state.

Nitrous air is absorbed by strong oil of vitriol nearly in the same quantity as by water; the acid acquiring a purple colour, by reason of the phlogiston contained in the nitrous air. The strong nitrous acid absorbs it in great quantity; and becomes smoking, orange coloured, and afterwards green, on account of the phlogiston contained in it. Marine acid imbibes but a small quantity, and very slowly, acquiring at the same time a light-blue colour. Both nitrous air and common air phlogisticated by it are meliorated by agitation in nitrous acid.

Nitrous air is absorbed in considerable quantity by radical vinegar, and the concentrated vegetable acid.—Solution of green vitriol imbibes it in much greater quantity than water, and acquires a black colour; which, however, soon goes off by exposure to the common air. Its taste also becomes acid.—Very little is absorbed by caustic alkalis. Oil-olive slowly absorbs a considerable quantity, but oil of turpentine absorbs much more. By a little agitation, it will imbibe more than ten times its quantity of nitrous air; acquiring at the same time a yellowish or orange colour, and becoming a little glutinous. The part which is not absorbed appears to be converted into phlogisticated air.—Ether and spirit of wine absorb it very quickly, but no nitrous air is obtained by the application of heat after they have absorbed it. It is greatly diminished by oil of turpentine, liver of sulphur, and pyrophorus; all of which leave it in a phlogisticated state. It is also diminished and phlogisticated by being kept in a bladder, alternately exposed to moisture and dryness. Nitrous acid air has the same effect.

One of the most remarkable properties of nitrous air, is its diminution with dephlogisticated air; by which means it becomes a test of the quantity of that kind of air contained in the atmosphere. With pure dephlogisticated air, the diminution is almost to nothing, at the same time that some quantity of nitrous acid is reproduced by the decomposition of the nitrous air; but as our atmosphere is always mixed with a considerable quantity of phlogisticated air, on which
nitrous

154

Diminishes
dephlogisti-
cated air.

Nitrous Air. Nitrous air has no effect, the diminution in this case is never so considerable. Upon this principle the Eudiometer is constructed.

155 Its antiseptic power. Another very remarkable property of nitrous air is its strong antiseptic power; inasmuch that animal matter may, by its means, be preserved for many months without corruption. This property, it was thought, might have been extremely useful on many occasions; but Dr Priestley, after a number of experiments on the subject, concludes in the following manner. "Nitrous air will indeed preserve meat from putrefaction; but after long keeping, it becomes very offensive both to the nostrils and palate, though the smell is not altogether that of putrefaction; and indeed the substance continuing quite firm, it could not be properly putrid. — Having formerly experienced the remarkable antiseptic power of nitrous air, I proposed an attempt to preserve anatomical preparations, &c. by means of it; but Mr Key, who made the trial, found, that, after some months, various animal substances were shrivelled, and did not preserve their forms in this kind of air."

156 Specific gravity of nitrous air. The specific gravity of nitrous air, as well as of other kinds, has been ascertained by Mr Kirwan. As it corrodes metals, he endeavoured to find its weight by comparing the loss sustained by the materials which produce it. Thus he found, that 14 grains of the materials produced 38.74 inches of nitrous air; and, consequently, by proper calculation, that the specific gravity of nitrous air is to that of atmospheric air as 1195 to 1000. — "If the air (says he) had been obtained over water, or in strong heat, its weight would probably have been very different; as it is liable to be mixed with phlogisticated air, nitrous vapour, and a variable quantity of water. Nitrous vapour would render it heavier, and phlogisticated air or water probably lighter."

157 Component parts of nitrous air. With regard to the constituent principles, or elements of nitrous air, all those who look upon phlogiston to be a distinct substance, have believed that the former is a compound of nitrous acid and phlogiston. By the opposite party, it is supposed to be a substance entirely simple, and one of the constituent parts of the nitrous acid. This opinion seems in part now to be entertained by Dr Priestley himself, notwithstanding his former sentiments on the subject. "I had no doubt on the subject (says he) until I read the work of Mr Methuier; who asserts, that nitrous air contains no proper nitrous acid, but only one of the elements of it; the other being dephlogisticated air, which had before been considered by Mr Lavoisier as the principle of all acidity. — Among other observations in support of his assertion, Mr Methuier has the following. 1. Nitrous air burnt together with inflammable air, produces no nitrous acid. 2. Though nitrous air be obtained from a solution of mercury in the nitrous acid, almost all the acid is found in the solution. 3. Nitrous air, absorbed by marine acid, does not make aqua regia. 4. He is of opinion, that a small portion of the nitrous acid being decomposed, furnishes a pure air, so altered, that, uniting with inflammable air, it changes it into nitrous air."

"In reviewing the experiments I had formerly made on this kind of air, I could not recollect any of them in which the pure nitrous acid was produced, ex-

cepting that with dephlogisticated air, besides the experiment in which it was decomposed by the electric spark; which furnishes a strong objection to this hypothesis." To ascertain the matter more fully, the following experiments were made.

"When nitrous air is decomposed by iron, or by a mixture of iron and sulphur, the water over which the process is conducted, acquires no acidity; but I had supposed that all the acid was absorbed by the iron. Having by me a quantity of this iron which had been reduced to perfect rust in nitrous air, and which, I knew, must have imbibed more than its weight of this air, I thought that the acid might be obtained from it by distillation; but a quantity of this rust of iron, distilled in an earthen retort, yielded neither nitrous air nor nitrous acid, at least in any quantity that could favour the common hypothesis."

"I then endeavoured to decompose nitrous air by heating iron in it with a burning lens; and in this process I succeeded far beyond my expectation: for the air was presently diminished in quantity, while the iron became of a darker colour, was sometimes melted into balls, and gathered considerable weight, though it had no appearance of containing any nitrous acid. — In the first experiment, the original quantity of nitrous air was diminished to about one-third; and after this, it was increased." The increase was found to arise from a production of inflammable and dephlogisticated nitrous air.

The Doctor proceeded to try various other experiments on the decomposition of nitrous air, particularly that of burning Homberg's pyrophorus; but without any success, or obtaining the smallest particle of nitrous acid. His conclusions from the whole are the following.

"Water seems to be a necessary ingredient in nitrous as well as inflammable air; at least, without a quantity of water, nitrous air cannot be formed. For example, copper will be dissolved in strong nitrous acid without producing any nitrous air, just as iron may be dissolved in concentrated vitriolic acid without producing inflammable air."

"That nothing is necessary to the formation of nitrous air besides phlogisticated nitrous acid and water, is evident from the production of it by the impregnation of pure water with phlogisticated nitrous vapour formed by the rapid solution of bismuth; an experiment which I mentioned before. However, to make it in a more unexceptionable manner, I interposed a glass vessel between that in which the solution was made and that in which the water to be impregnated with the phlogisticated vapour was contained; that whatever was distilled over by the heat of the process might be prevented from reaching the water. In these circumstances, however, when nothing but the dry phlogisticated vapour could enter the water, it began to sparkle and yield nitrous air very copiously as soon as it had received a bluer tinge from the impregnation. — Nitrous air is also produced by pouring a highly coloured or phlogisticated nitrous acid into pure water, into which no metal or earthy matter is any way concerned."

"I have formerly observed, how readily nitrous air is diminished by taking the electric spark in it. This experiment I have frequently repeated, in order more particularly to ascertain the effects of the electric spark on nitrous air."

Nitrous Air.

158 Nitrous air composed of phlogisticated nitrous acid and water.

159

Nitrous Air.

particularly to ascertain the quantity and quality of the residuum. In one experiment half an ounce of nitrous air was reduced, in less than half an hour, to one quarter of its bulk. One fourth of the residuum was still nitrous, and the rest phlogisticated. Taking the electric spark in a quantity of nitrous air till it was diminished to one-third, the whole was completely phlogisticated, not affecting common air at all, and extinguishing a candle. A white matter was formed with the mercury over which the spark was taken, which made the water admitted to it extremely turbid. In another process, the electric spark was taken in a quantity of nitrous air till it could be no more diminished, when it was reduced in bulk in the proportion of $10\frac{1}{2}$ to 24. Letting it stand all night upon the mercury, it was increased in the proportion of $11\frac{1}{2}$ to 24; seemingly by the acid uniting to the mercury and generating more nitrous air, since it had that smell. No water appeared after the process; and the water admitted to it acquired no acid taste, but an astringent one like that of water impregnated with nitrous air. There was a white powder formed, as in the former experiments.—To try if it were possible to make water imbibe the acid from the nitrous air, the electric spark was taken in it, with a small quantity of water over the mercury. But even this water did not acquire any acid taste, but only an astringent one.”

The Doctor concludes his experiments on this subject with a conjecture, that the phlogiston, and neither the heat nor light of the electric, contributes to the decomposition of the nitrous air. As his final sentiments on the matter, however, are merely conjecture, without any certain experiments to confirm them, we shall here refer the Reader to his Section on Theory, at the end of his sixth volume of Experiments, &c.

SECT. X. Of Dephlogisticated Nitrous Air.

160
How procured.

THIS species differs from common nitrous air in being able to support flame, though it still continues fatal to animal life. Common nitrous air may be converted into the dephlogisticated kind by particular processes; though, when zinc is dissolved in the nitrous acid, if the air be taken at different times, that which comes about the middle, or rather the latter end of the process, will be of this kind; in which it not only supports the burning of a candle, but the flame is enlarged (sometimes to four or five times its original bulk) by the addition of a weaker and bluish flame round the former; and this burning is sometimes accompanied with a crackling noise, as if the candle was burning in dephlogisticated air. It may also be obtained in some parts of the process of procuring nitrous air from iron, though with this metal the success is uncertain; but tin yields a considerable quantity of it. By exposing iron to nitrous air, it may be so far dephlogisticated as to admit a candle to burn in it. Dr Priestley filled an eight-ounce phial with nails, and then with mercury; and displacing the mercury with nitrous air, left the phial inverted in a quantity of the same fluid. Two months after, the nitrous air was found to be changed in such a manner as to admit a candle to burn in it with its natural flame; and by continuing still longer in contact with the iron, a candle would burn in it with an enlarged flame. These changes, however,

are very irregular, so that they seldom produce the effects with the regularity one might expect. Dr Priestley once found, that by the contact of iron in quicksilver, it was so changed as to be fired with an explosion like a weak inflammable air; whilst another quantity of nitrous air, which had been treated in like manner for about the same length of time, only admitted a candle to burn in it with an enlarged flame. In that section of his last volume in which the Doctor treats of this kind of air, he observes that water is absolutely necessary to its composition, or rather to the decomposition of the common nitrous air by iron. He had decomposed it before, either by previously filling the vessels that were to contain the nitrous air with water or with mercury; though it had always required a much longer time when the latter was made use of. The reason of its being formed at all in this last way, was a small quantity of moisture adhering to the inside of the vessel containing the mercury.

To try the influence of water in this case, he now procured a number of very clean small needles; and having made a phial, and likewise a proper quantity of mercury, quite clean and dry, he put the needles into the phial, and, filling it up with mercury, introduced the nitrous air: but it continued in this way for six or eight months without the smallest alteration. Introducing a few drops of water, a diminution of about one-third of the air took place, and the remainder appeared to be phlogisticated. On the 26th of May 1782, he examined a quantity of nitrous air, which had been confined with iron-shavings from the 27th of August preceding, when he found one-half of it absorbed; the remainder supported the flame of a candle better than common air, though a mouse died in it; and yet this air had continued several months in the same state with regard to quantity, nor was it at all probable that its quality would have been altered by any length of time.

Though this kind of air is produced by the contact of iron and nitrous air, the Doctor has never been able to ascertain the quantity of nitrous air which a given quantity of iron can decompose; and though iron soon becomes so much affected by this process that it crumbles into powder, it still seems equally capable of decomposing a fresh quantity. Having made a comparative experiment, by putting together one quantity of nitrous air with fresh iron and another with rust, he found that in both the air was diminished to about one-third, and a candle burned in both equally well; but neither of them had the properties of fresh nitrous air in any degree.

As the process for obtaining dephlogisticated nitrous air by means of iron is very tedious, the Doctor endeavoured to find another which might be attended with less inconvenience. This he accomplished by dissolving turnings of iron in a dilute solution of copper in nitrous acid (the same that remains after the production of nitrous air), mixing it again with an equal quantity of water. Without this precaution, he tells us, that though the iron will at first be acted upon very slowly, yet the mixture will at length grow so hot as actually to boil, and the process will be exceedingly troublesome; however it will be necessary, previous to any attempt to dissolve the iron, to heat the solution of copper, in order to expel all the nitrous air and superfluous

Dephlogisticated Nitrous Air.

161
Component parts of dephlogisticated nitrous air.

162
Effects of water on nitrous air.

163
Best method of procuring it.

Dephlogi-
sticated Ni-
trous Air.

fluuous nitrous acid. Without this precaution a quantity of common nitrous air will be produced.

Dephlogistified nitrous air is absorbed by water almost as readily as fixed air, and in considerable quantity; the liquid taking up about one-half its bulk of air. After being thus saturated, the whole quantity of dephlogistified nitrous air may be expelled pure by heat, and is easily received in vessels containing mercury. It was likewise observed, that as this kind of air much resembles fixed air in its properties of being imbibed by water, and expelled again by heat, it resembles it also in this farther property, that all the air which has been actually incorporated with the water will not be imbibed by water again. But the proportion of this part is three or four times greater than the corresponding part of fixed air; it is also considerably more phlogistified. Water impregnated with it very soon parts with it again on being exposed to the atmosphere.—It discovers not the smallest trace of containing either acid or alkali. Its specific gravity is less than that of common air. On heating red precipitate in this kind of air, pure dephlogistified air was produced without affecting, or being affected by, the nitrous air. Repeating the experiment with malleable iron, the quantity of it was enlarged, and the whole phlogistified, without any mixture of fixed air. By heating bits of clean crucibles or retorts in this kind of air, it seemed to approach in quality to common atmospheric air; and the effects were always found to be the more considerable the longer the process was continued. On attempting, however, to determine whether this change in the constitution of dephlogistified nitrous air was occasioned by means of heat or light, he heated it in earthen tubes; but found, that though these were glazed both on the outside and inside, and seemed perfectly air-tight both before and after the experiment, the air had escaped. By the electric spark it was rendered wholly immiscible with water, and brought to the standard of 1.45; so that the Doctor had no doubt of its being respirable. Yet this kind of air, though it admits a candle to burn so well in it, will not kindle pyrophorus, though the nitrous air from which it is produced would instantly set it on fire.

SECT. XI. Of Vitriolic, Nitrous, Marine, and other Acid Airs.

165
How pro-
cured.

§ 1. *Vitriolic acid Air.*—This is always a combination of vitriolic acid with phlogiston, and consequently may be procured from any mixture of that acid in its highly concentrated state with phlogistic matters. Hence it is obtained from all the metals, gold and platina excepted, on boiling them with strong oil of vitriol. It is also procurable from the same acid rendered black by any phlogistic matter. No greater heat is required to expel this kind of air than that produced by the flame of a candle. It is the heaviest of all aerial fluids, next to fluor acid air, being to common air as 2265 to 1000. Dr Priestley informs us, that a quantity of vitriolic acid thus impregnated with phlogiston, will yield many times more air than an equal quantity of the strongest spirit of salt.—When the vitriolic acid air is produced in great plenty, the top of the phial in which it is generated is commonly filled with white vapours. The air has also the same appearance as it is transmitted through

the glass tube; and it is sometimes discoverable in the recipient. When such substances are put to the oil of vitriol as cause a great effervescence with that acid, care should be taken to add them by very small quantities at a time, and likewise to apply the heat by very slow degrees, lest the rapid production of air, and the heat attending it, should break the vessels. It is most equally produced by using strong oil of vitriol and charcoal; but in most cases the production of vitriolic acid air is attended with that of inflammable, and sometimes fixed or phlogistified air. With ether about one-half of the first produce is inflammable; but the quantity lessens as the process goes on. The Doctor observed, that, when quicksilver was used, the acid was not turned black, as in other experiments of the like nature. He also observed, that iron yielded a little inflammable air together with the acid gas; but that the elastic fluid produced when zinc was used, contained about two parts of inflammable and one of acid air. Copper, silver, and lead, when heated in vitriolic acid, yield the purest vitriolic acid air, without any mixture of inflammable air; but the lead yields only a very small quantity, and requires a great degree of heat. It is procured in the greatest abundance from the fumes of burning sulphur, and is then called the *volatile vitriolic*, or *sulphureous acid*; for an account of the properties of which, see CHEMISTRY, (Index).

§ 2. *Of Nitrous Acid Air.*—This is the pure nitrous acid by itself, without any addition of phlogiston. It is procured by heating the strong spirit of nitre in a phial, and then receiving the vapour in glass vessels filled with quicksilver. It is, however, extremely difficult, or rather impossible, to preserve it for a length of time by means of any fluid hitherto known. Water absorbs it immediately, and quicksilver is corroded, and produces nitrous air. “But (says Dr Priestley) tho’ the acid vapour very soon unites with the quicksilver, yet, the jar in which it was received being narrow, the saline crust which was formed on the surface of the quicksilver, impeded the action of the acid upon it till I had an opportunity of admitting water to the air I had produced, and of satisfying myself, by its absorption, of its being a real acid air, having an affinity with water similar to other acid airs.”

The most remarkable property of this vapour is, that its colour may be made more or less intense by the mere circumstance of heat. It may be confined in glass vessels with ground-stoppers, or in tubes hermetically sealed, and thus exposed to the action of heat: in which case it will be found, that the colour of the vapour becomes considerably more intense in proportion as the glass vessel containing it is more or less heated; and that, on the contrary, the intensity of the colour diminishes as it is cooled. “It seems probable (says Dr Priestley), that if this vapour was not confined but had room to expand itself, it would become colourless with heat. This at least is the case when it is combined with water. The phenomena I refer to are very common in the process for making dephlogistified air, in which I first observed them. But the same things are observable in the process for producing any other kind of air in which much spirit of nitre is made use of; and likewise constantly in the common process for making spirit of nitre itself. It is, that when the heat is moderate, the vapour within

Nitrous
Acid Air.166
How ob-
tained.167
Cannot be
preserved
by means
of fluids.168
Assumes a
red colour
by being
heated.

Marine
Acid Air.169
Its effects
on red-lead.

the glass tube or retort is red; but that, as the heat increases, it becomes transparent." The Doctor having observed that red lead, impregnated with nitrous vapour, may be preserved a long time without deliquescing or losing its acid, made use of a composition of this kind for procuring the nitrous vapour with which he filled his tubes. By imbibing this vapour the minium lost its red colour and became white. "I put (says he) a small quantity of this white minium into a glass tube closed at one end; then holding it to the fire, make it emit the red vapour till the whole tube is filled with it; and having the other end of the tube drawn out ready for closing, as soon as the vapour begins to issue out of that end, I apply my blowpipe and seal it. By this means I conclude that the tube is filled with a pure red vapour, without any mixture of nitrous air, and perhaps common air also." For a further account of the properties of nitrous acid air, see CHEMISTRY, (Index.)

170
How ob-
tained.

§ 3. *Of Marine Acid Air.*—The marine acid, by heat, may be resolved into a permanently elastic and transparent invisible vapour, which, however, is more easily preserved in its aerial state than nitrous acid air, as the former has no effect upon quicksilver. An easy and cheap method of obtaining this kind of air is by filling a phial, fitted with a glass tube and stopper, with common salt, and then pouring a small quantity of oil of vitriol upon it; which, by the assistance of heat, will disengage the acid principle, or the marine acid-air, from the salt. "A phial (says Dr Priestley) prepared in this manner will suffice, for common experiments, many weeks; especially if some more oil of vitriol be occasionally put to it. It only requires a little more heat at the last than at the first. Indeed, at first, the heat of a person's hand will often be sufficient to make it throw out the vapour. In warm weather it will even keep smoking many days without the application of any other heat. On this account it should be placed where there are no metallic utensils which it can corrode; and it may easily be perceived when the phial is throwing out this acid vapour, as it always appears in the open air in form of a light white cloud."

171
Its proper-
ties.

After the marine acid has yielded all the air that can be expelled from it, it is extremely weak, so that it can but barely corrode iron. The gas itself is considerably heavier than common air, the specific gravity of the two being in the proportion of five to three; a cubic inch weighing 0.654 grains. It is very fatal to animal life, but less so than pure nitrous air; for flies and spiders live longer in marine acid than in nitrous air. In dipping a candle into a jar of this air the flame is extinguished; but the moment before it goes out, and also when it is afterwards first lighted again, it burns with a green or light blue flame, like that of common salt thrown into a fire. Its diminution by the electric spark is barely perceptible. Ice is dissolved by it as fast as if it touched a red hot iron. It is partly absorbed by almost every substance containing phlogiston, and the remaining part becomes inflammable. Oil of olives absorbs it very slowly, and oil of turpentine very fast; by which they both become almost black, and the remainder of the air is inflammable. Essential oil of mint absorbs marine air pretty fast, becoming brown, consistent, and so heavy

No 5.

as to sink in water; and its smell is in great measure altered. Ether absorbs it very fast, and has its colour altered by the impregnation, becoming first turbid, then yellow, and at last brown. The air over the ether is strongly inflammable. A small bit of phosphorus smoked and gave light in this acid air; and the elastic fluid was but little diminished in twelve hours. On the admission of water, about four-fifths of the gas were absorbed and the rest was inflammable. This change was also effected by a great number of other substances: some of which, however, required a considerable time to produce their effect; such as crusts of bread not burned, dry wood, dry flesh, roasted pieces of beef, ivory, and even flints. See CHEMISTRY, (Index.)

§ 4. *Of Fluor Acid Air.*—The discovery of fluor acid air was made by Mr Scheele, who obtained it by distilling the spar called fluor with vitriolic acid. Dr Priestley, who made several experiments upon the subject, was of opinion that this new acid was only the vitriolic disguised by its connection with the fluor. He even supposed that he had produced it by pouring vitriolic acid on other phosphoric spars: both these opinions, however, he has now retracted, and believes the fluor acid to be one of a peculiar kind. Its most remarkable property is the great attraction it has for siliceous earth, so that it even corrodes and makes holes in the retorts in which it is distilled. See CHEMISTRY, (Index.)

§ 5. *Of the Vegetable and another Acid Air.*—By means of heat alone, the concentrated vegetable acid emits a permanently elastic and aerial fluid. This has the properties of the acid of vinegar; but, like it, is weaker than the rest of the mineral acid airs, though it agrees with them in its general characters. Water imbibes it as readily as any of the other acid airs; oil-olive readily absorbs it, and in considerable quantity, losing at the same time its yellowish colour, and becoming quite transparent. Common air is phlogistigated by it, as it is also by the liquid vegetable acid. As the vegetable acid, however, from which this air had been obtained, was distilled by oil of vitriol, the Doctor suspected, that what he had examined might derive most of its properties from the oil of vitriol, and rather be vitriolic than vegetable acid air.

An acid air, somewhat different from any hitherto described, was obtained by Dr Priestley from the vapour arising on distilling to dryness a solution of gold in marine acid impregnated with nitrous acid vapour, which makes the best kind of aqua regia. "The produce (says he) was an acid air of a very peculiar kind, partaking both of the nature of the nitrous and marine acids; but more of the latter than of the former, as it extinguished a candle; but it was both extinguished and lighted again with a most beautiful deep blue flame. A candle dipped into the same jar with this kind of air went out more than 20 times successively, making a very pleasing experiment. The quantity of this acid air is very great; and the residuum I have sometimes found to be dephlogistigated, sometimes phlogistigated, and at other times nitrous, air."

SECT. XII. *Of Hepatic Air.*

THIS species of air, first particularly taken notice of by Mr Bergman, who obtained it from an ore of zinc

Fluor Acid
Air, &c.172
Changed
into inflam-
mable air.173
Different
from vitrio-
lic acid air.174
Phlogisti-
cates com-
mon air.175
Air from
solution of
gold.

Atmospherical Air. *zinc called Pseudogalena nigra Dannemorensis*, and which was found to contain 29 parts of sulphur, one of regulus of arsenic, six of water, six of lead, nine of iron, 45 of zinc, and four of siliceous earth. The hepatic air was produced but in small quantity by pouring oil of vitriol on this mineral; spirit of salt produced it in much larger quantity; but nitrous acid produced only nitrous air. The most proper method of obtaining this air is by pouring marine acid on hepatic sulphur, which extricates it in vast quantity. It is said also to be sometimes produced naturally from putrefying matters. It is the characteristic of all livers of sulphur, whether they be made with alkalis or earths. The smell of the pure gas is intolerable; and the vapour has a disagreeable effect on many metallic substances, particularly silver, lead, copper, &c. destroying their colour, and rendering them quite black. It is suddenly fatal to animal life, renders syrup of violets green, and is inflammable, burning with a very light blue flame. It is decomposed by vitriolic and nitrous air, by dephlogisticated air, and by the contact of atmospherical air, in which case it deposits a small quantity of sulphur; being indeed, as is supposed by Mr Bergman and Mr Kirwan, no other than sulphur kept in an aerial form. Its specific gravity, compared with that of atmospherical air, is as 1106 to 1000. It combines readily with water, and gives the smell to the sulphureous medicinal waters. Its great attraction for some of the metals and their calces makes it the basis of some *Sympathetic Inks*. See also *CHEMISTRY-Index*.

SECT. XIII. Of Atmospherical Air.

THE two component parts of our atmosphere, viz. dephlogisticated and phlogisticated air, have been so fully treated of under their respective sections, that little remains to be said in this place, excepting to determine the proportion in which they are usually met with in the common air. The only regular set of experiments which have been made on this subject are those of Mr Scheele. He constructed an eudiometer, consisting of a glass receiver, which could contain 34 ounces of water, and a glass cup containing a mixture of one pound of iron-filings, and an equal weight of flowers of sulphur moistened; which cup standing upon a glass supporter, was inserted in the former receiver, which, when this was in it, could contain 33 ounces of water. To the outside of the glass tube or receiver, was affixed a slip of paper, to the height of a third of the tube, containing 11 divisions, each corresponding to one ounce of water. This paper was varnished over with oil varnish, to prevent its being spoiled by water. The whole then was placed in water, which gradually rose as the air was diminished. This mixture would serve four times before the power of diminishing air was lost. He carefully compared the height of the air therein with the barometer and thermometer, both before and after the experiment; in eight hours the experiment was completed. With this instrument he examined the goodness of the common air in Stockholm every day for a whole year, and found the diminution never to exceed $\frac{1}{30}$, nor to fall short of $\frac{1}{11}$; so that upon a medium it may be estimated at $\frac{1}{11}$. During the months of January and February it

Vol. I. Part I.

was $\frac{2}{11}$. The 23d of March it was $\frac{2}{11}$, though the cold increased, and the barometer stood higher than before. The 19th of April it was $\frac{1}{11}$, though the barometer and thermometer did not vary, and so stood till the 21st. In May and June it stood between $\frac{1}{11}$ and $\frac{2}{11}$. The 30th of July it stood at $\frac{1}{11}$. From the 3d to the 15th of September at $\frac{2}{11}$. The 6th of October at $\frac{1}{11}$, during a high storm; but after it stood between $\frac{1}{11}$ and $\frac{2}{11}$, till the fourth of November, when it fell to $\frac{1}{11}$, and continued between $\frac{1}{11}$ and $\frac{2}{11}$ to the 20th, when it rose to $\frac{1}{11}$. The 21st it fell to 8, and stood between $\frac{1}{11}$ and $\frac{2}{11}$ till the 8th of December, when it rose to $\frac{2}{11}$; and from thence to the 31st it stood between $\frac{1}{11}$ and $\frac{2}{11}$.

As it has already been shown that the pure dephlogisticated part of the atmosphere is entirely consumed by phlogistic processes, such as that of fermenting brimstone and iron-filings, this eudiometer must be considered as an exact test of the proportion of dephlogisticated air contained in the atmosphere. The small variation in the quantity shows, that the processes in nature which destroy this air, are nearly balanced by those which produce it; though it must appear surprising, that both these fluids, so extremely different, should be produced at all seasons of the year in a proportion nearly equal; nor is it less surprising that two fluids of unequal specific gravity should remain incorporated together without any tendency to separate, which it is certain they never do, either in the atmosphere itself, or when confined in vessels in any quantity whatever.—As phlogisticated air is somewhat lighter than dephlogisticated, it might be supposed that the former would occupy the higher regions of the atmosphere in such a manner as to render them considerably more unwholesome than the lower parts; but this seems not to be the case: On the contrary, it appears by experiments with the eudiometer, that the upper parts of the air contain a greater proportion of dephlogisticated air than those near the earth. See EUDIOMETER.

SECT. XIV. Of the artificial Production of Airs of different Kinds.

§ 1. *FIXED Air, or Aerial Acid.* The artificial methods of producing this are principally three, viz. by fermentation, by heat, and by acids.

(1.) *By fermentation.* When vegetable or animal substances, especially the former, are fermented, they yield a great quantity of fixed air. In breweries, on the surface of the fermenting liquor, there is always a stratum of fixed air reaching as high as the edge of the vats; so that if these vessels are deep, and the fermenting liquor much below their edges, the above mentioned stratum may be some feet in thickness. The same phenomenon is observable in the fermentation of wines in general; and it is owing to the production and elasticity of fixed air, that fermenting liquors, when put into close vessels, often burst them with great violence. The case is the same whatever substance it is that undergoes the vinous fermentation, though the quantity of fixed air produced is not the same in all substances, nor even in the same substance at different times. From 42 cubic inches of beer Dr Hales obtained 639 cubic inches of air in 13 days. From a quantity of sugar undergoing

A a

Of Artificial
Airs.

undergoing the vinous fermentation, Mr Cavendish obtained so much fixed air, that out of 100 parts of the former 57 appeared to have been volatilized and converted into fixed air.

But though a vast quantity of fixed air escapes during this process of fermentation, a very considerable portion still remains united with the fermented liquor, and to this it owes all its briskness and agreeable pungent acidulous taste; for when the fixed air is totally evaporated, the liquor becomes entirely vapid and flat. Hence also we are furnished with a method of restoring the briskness to these liquors after they have lost it in consequence of being exposed to the atmosphere, viz. by impregnating them again with fixed air, either naturally or artificially produced.

Dr Priestley has made several experiments in order to determine the quantity of fixed air contained in several sorts of wine. His method was to take a glass phial (fitted with a ground stopple and tube), capable of containing $1\frac{1}{2}$ ounce-measure. This he filled with wine, plunging it into a proper vessel of water. The whole was then put over the fire, and the water, into which the phial was plunged, suffered to boil. The end of the tube being placed under the mouth of an inverted receiver filled with quicksilver, the heat expelled the fixed air from the wine, which entering into the receiver, ascended in bubbles through the quicksilver to the top, pushing out part of the metal and taking its place. The result of his experiments was as follows:

$1\frac{1}{2}$ oz. measure of	Madeira	of pure fixed air contained	$\frac{1}{100}$	of an ounce measure
	Port of six years old		$\frac{1}{48}$	
	Hock of five years		$\frac{1}{24}$	
	Barrelled claret		$\frac{1}{12}$	
	Tokay of 16 years		$\frac{1}{10}$	
	Champagne of two years		2 oz. measures.	
	Bottled cyder of 12 years		$3\frac{1}{4}$ ditto.	

During the acetous fermentation also, liquors emit a vapour, great part of which is fixed air, though the nature of its other component parts has not yet been thoroughly ascertained.

Fixed air is likewise produced, though in no great quantity, by putrefaction. In this case, however, a great part of the elastic fluid consists of inflammable and phlogisticated air, and the fixed air itself seems to be intimately connected with a putrid offensive effluvia. It seemed to Dr Priestley to "depend in some measure upon the time and other circumstances in the dissolution of animal or vegetable substances, whether they yield the proper putrid effluvia, or fixed or inflammable air."

The elastic fluid produced by putrefying vegetables, when kept in a moderate degree of heat, is almost all fixed air; while that from animal substances contains several times more inflammable than fixed air. Vegetable substances yield almost all the permanently elastic fluid in a few days, but animal bodies continue to emit it for several weeks. When the elastic fluid yielded by animal substances is absorbed by water, and that water boiled, the fixed air may then be obtained without any mixture of the putrid effluvia. It is also to be observed, that the quantity of elastic fluid producible from animal substances is various according to the nature of the parts of the animal employed. Thus the muscular parts will yield less elastic fluid, and also

less mixed with any putrid or offensive effluvia, than a whole animal, or than the liver, &c. The proportion of inflammable and of fixed air is also various, according to the various parts employed.

(2.) *By heat.* In every combustion, except that of sulphur or of metals, a quantity of fixed air is generated. This may be observed by fixing a lighted candle in an inverted receiver over a basin of lime-water, for a precipitation of the lime will presently ensue; and the same precipitation (which is one of the characteristics of fixed air) will always ensue, whether a candle, a burning piece of wood, or, in short, any other combustible substance, except sulphur or metals, be made use of.

During this production or extrication of fixed from atmospherical air, the latter is commonly supposed to be considerably diminished, though Mr Lavoisier and Mr Scheele have now rendered that opinion doubtful. If a piece of charcoal be burned by throwing the focus of a lens upon it when contained in a glass-receiver inverted in water, after the apparatus is cooled, the water will have mounted a small way into the receiver. The diminution, however, is limited, and depends on several circumstances. Dr Hales has observed, that, in equal receivers, the air suffers a greater diminution by burning large candles than small ones; and likewise that, when equal candles are made use of, the diminution is greater in small than in large receivers. The cause of this phenomenon probably is, that the air contained in the receiver cannot all come into contact with the flame of the candle; whence, as soon as the air which is nearest the flame becomes contaminated, the candle is extinguished. Thus the author of a Concise Treatise on the Various Kinds of Permanently Elastic Fluids, has diminished the air of an inverted receiver one sixth part, by moving the candle whilst it burned through the different parts of the vessel, so that the flame was brought into contact with a greater quantity of the confined air than if it had remained in one situation till it became extinct. Dr Mayow observed, that by the burning of a candle the air was diminished of one-thirtieth only; Dr Hales found it to be diminished of one-twenty sixth part; and Dr Priestley found it to be diminished of one-fifteenth or sixteenth. Mr Cavendish observed, that air suffered a diminution of one-tenth of the whole quantity, by passing through an iron tube filled with red-hot powder of charcoal. A candle, or any other combustible body, will cease to burn by itself, and consequently to contaminate a quantity of confined air much sooner than when it is, in some manner, forced to burn by the external application of heat. "The focus of a burning mirror," says Dr Priestley, "thrown for a sufficient time either upon brimstone or wood, after it has ceased to burn of its own accord, and has become charcoal, will have a much greater effect of the same kind, diminishing the air to its utmost extent, and making it thoroughly noxious." The combustion of the phosphorous of urine diminishes air in a great degree. Mr Lavoisier has observed, that by the combustion of phosphorus, air may be diminished of about one-fifth or one-sixth. This accurate philosopher has also observed, that the acid of phosphorus thus formed, acquires the weight lost by the diminished air; finding that about three inches of air were absorbed by every one

Of Artificial Airs. one grain of phosphorus, when the experiment was tried with a receiver inverted in water, upon the surface of which a small quantity of oil had been introduced; but when the receiver was inverted in quicksilver, the absorption was constantly between two one-fourth and two three-fourth inches for each grain. Mr Cavallo mentions his having often repeated the experiment of burning phosphorus in a glass tube inverted in water, by applying the closed part of the tube, wherein the phosphorus was contained, to a pretty strong fire, when he always observed that the utmost diminution of the inclosed air effected by this means was full one-fifth.

Dr Hales remarked, that after the extinction of candles in a receiver, the air continued to diminish for several days after. This may be owing to the gradual absorption of part of it by the water; it having been remarked by Dr Priestley, "that this diminution of air by burning is not always immediately apparent, till the air has passed several times through water; and that when the experiment was made with vessels standing in quicksilver instead of water, the diminution was generally inconsiderable till the air had passed through water."

In these experiments of burning combustible bodies in a quantity of air, and measuring the diminution, we should always remark two causes of mistake, viz. the absorption of air by the coaly residuum of the burned matter, which sometimes is very considerable, or by the fluid in which the receiver is inverted, and the production of elastic fluid from the burning substances; thus gunpowder generates a great quantity of elastic fluid when inflamed, &c.

Even the electric spark separates fixed air from common atmospherical air; for when a number of these sparks are taken in a small quantity of common air over lime-water, a diminution will take place, the lime will be precipitated, and if we put a blue vegetable juice instead of the lime-water, it will be turned red by the acidity of the fixed air deposited upon it. Dr Priestley having cemented a wire into one end of a glass tube, the diameter of which was about one-tenth of an inch, and having fixed a brass ball to that extremity of the wire which was out of the tube, filled the lower part of it with the juice of turnsole or archil, so that a quantity of common air was contained in the tube between the extremity of the wire and the surface of the liquor. Then taking electric sparks between the said wire and liquor for about one minute, the upper part of the liquor began to look red, and in about two minutes it was manifestly so. The air, at the same time, was diminished in proportion as the liquor became red; but when the diminution arrived to be one-fifth of the quantity of the air contained, then a longer electrization produced no sensible effect. "To determine," says the Doctor, "whether the cause of the change of colour was in the air or in the electric matter, I expanded the air which had been diminished in the tube by means of an air-pump, till it expelled all the liquor, and admitted fresh blue liquor in its place; but after that, electricity produced no sensible effect, either on the air or on the liquor; so that it was evident that the electric matter had decomposed the air, and had made it deposit something that was of an acid nature."

The calcination of metals, as already observed, phlogisticates, and consequently diminishes common air;

but does not produce any fixed air, since the lime-water, over which the calcination is made, does not become turbid; and when metallic calxes are exposed to a sufficient strong heat, they in general yield some fixed air: so that it seems that the fixed air which is formed in the act of the calcination of metals is absorbed by the calx. Some fixed air may be obtained from red lead, by no greater degree of heat than that of the flame of a candle applied to the phial that contains it.

The calcareous earths, which, when acted on by acids, yield a vast quantity of fixed air, produce a very small quantity of it when exposed to a strong heat by themselves, in a proper vessel, even when exposed to the focus of a lens. Dr Priestley, in his experiments relating to the production of dephlogisticated air from various substances, when moistened with nitrous acid, and afterwards exposed to a sufficient degree of heat, generally found that some fixed air was produced together with the dephlogisticated air; but often obtained fixed air only, without any dephlogisticated air being mixed with it, or fixed and nitrous air together. From half an ounce of rust of iron, moistened with spirit of nitre, and dried, he obtained about a quart of elastic fluid, about one-third of which was fixed and the rest nitrous air. From ashes of pit-coal, treated in the same manner, he obtained nearly the like result. But in those experiments, the Doctor mostly used a gun-barrel, into which he introduced the substances to be tried; so that it is very probable, as he justly observes, that the iron might have contributed to the formation of the fixed air. In fact, when he tried substances of the same sort, first in a gun-barrel and then in glass vessels, he obtained much more fixed air in the former than in the latter case. One of those experiments he made with tobacco-pipe clay, which, after being moistened with spirit of nitre, was when dry exposed to the fire in a gun-barrel, and yielded some elastic fluid, which appeared to be wholly fixed air; but repeating the experiment in a glass-phial with a ground-stopper, and taking the produced elastic fluid at eight different times, found that on the beginning some fixed air was produced, but afterwards the produce was dephlogisticated air. He made a similar experiment with flints carefully calcined in close vessels, and obtained a similar result.

Most minerals contain fixed air, which may be extracted to a certain degree by means of heat. Mr Krenger, distilling a greenish fusible spar, which was luminous in the dark, obtained from it some permanently elastic fluid, which, like fixed air, crystallized a solution of fixed alkali. Mr Fontana, in his analysis of the malachite, finds that that mineral contains a vast quantity of fixed air, as pure as that which is extracted from chalk by means of vitriolic acid.

From almost every metallic ore and earthy mineral some fixed air may be obtained, as well as from chalk, lime-stone, marble, marine shells, fixed and volatile alkali, and from magnesia alba, by means of a violent fire, or of acids.

In Mr Boyle's, Dr Boerhaave's, and Dr Hales's works, and in other books, the quantities of elastic fluid generated in various processes, and by divers substances, are mentioned with distinction; but as those writers were not acquainted with the characteristic properties of fixed air, we do not know whether the elastic fluid mentioned by them was pure fixed air or not.

Of Artificial Airs.

180

Obtained from earths by means of heat.

181

From different minerals.

Of Artificial
Airs.

From animal substances, mixed with spirit of nitre, and sometimes heated a little, in order to facilitate the production of elastic fluid, Dr Priestley obtained, in general, fixed air; but whereas the fixed air produced by a similar process with vegetable substances is mostly mixed with nitrous air, this is mixed with an elastic fluid, which is seldom nitrous in a very slight degree, but is often phlogisticated air, viz. in such a state as extinguishes a candle, does not diminish common air, nor is itself diminished by nitrous air. Towards the end of the process, the Doctor remarks, "that when, by means of a strong heat, the produce of air is very rapid, and the air full of clouds, it is, like air, produced from vegetable substances in the same circumstances, slightly inflammable, burning with a lambent, greenish, or bluish flame."

182
Abundant-
ly produced
from calca-
reous sub-
stances.

(3.) *By acids.* Calcareous substances in general produce abundance of fixed air when acted upon by any acid, only the strongest acids will expel from them more fixed air than the weakest; and it happens to be peculiarly advantageous for those who want to produce a great quantity of fixed air, that the vitriolic acid is both the cheapest and strongest acid, and, upon the whole, the fittest for this purpose. The phenomena attending the production of fixed air from calcareous substances, &c. are themselves very remarkable, and furnish the subject of much speculation in philosophy.—The principal facts are the following. 1. When calcareous earths, alkalis, and magnesia, in their usual state, are mixed with acids, they cause an effervescence; and consequently the production of a permanently elastic fluid, namely, fixed air. 2. These substances retain the fixed air very obstinately; so that a strong fire is necessary to expel it from magnesia, and the strongest is not sufficient to expel it entirely from fixed alkalis, and especially from calcareous earths (A). When these substances are treated with acids, they yield the fixed air, because they have a stronger attraction to those acids than to the fixed air. 3. The calcareous earths which are insoluble in water, when deprived of the fixed air become soluble in it. Thus lime-stone is not soluble in water, but lime (viz. lime-stone deprived of its fixed air) is soluble in water. And if those substances, deprived of their fixed air, are put in a situation proper to recover their lost fixed air, they lose the property of being soluble in water. Thus, when lime-water is exposed to fixed air, the lime absorbs the fixed air; and, losing at the same time its property of being soluble in water, is precipitated from it in the state it was before calcination, viz. of a calcareous earth insoluble in water, and capable of effervescing with acids. 4. Alkalis, both fixed and volatile, when deprived of their fixed air, become more caustic, and more powerful solvents, incapable of crystallization, and of effervescing with acids. But if to those alkalis, and also earths rendered more caustic, their fixed air be restored, they acquire at once all the properties they had before they were deprived of the fixed air, viz. they become more mild, effervesce with acids, recover their weight, &c.

Those properties of calcareous earths and alkalis were ascertained by the learned Dr Black, who performed a variety of decisive and well-contrived experiments, upon which he formed a just theory, viz. that the causticity, sharpness, solubility, &c. of those substances, was owing to the fixed air being expelled from them; and that when they were combined with a proper quantity of fixed air, they were mild, &c. The Doctor gives the epithet of *mild* to those substances when they are combined with air, and of *caustic* when deprived of it; as caustic calcareous earth, caustic fixed alkali, &c. Among the other experiments, he connected two phials by means of a bent tube; in one of which he put some caustic spirit of sal ammoniac, and in the other some mild alkali, or mild calcareous earth; then pouring, through a hole made in the side of the latter phial, some acid upon the mild alkali, so as to produce some fixed air, which, passing through the tube into the other phial, combined with the spirit of sal ammoniac, and rendered it mild.

Easy Methods of obtaining Fixable Air for occasional Experiments. &c.

(1.) *By Fermentation.* Mix together equal parts of brown sugar and good yeast of beer, to which add about twice the bulk of water. This mixture being put into a phial, to which a bent tube with a cork may be adapted, will yield a considerable quantity of fixed air, which may be received into a phial filled with quicksilver or water, as in the following process.

(2.) *By Acids.* Let a glass tube, open at both ends, be bent, by means of a blow-pipe and the flame of a candle, nearly into the shape of an S, as it is represented by AB, and fix a cork D to one of its extremities, so as to fit the neck of a common phial, that may hold about four or five ounce-measures. The hole through the cork may be made with an iron wire red-hot, and the tube may be fastened in it with a bit of soft wax, so as not to let any air go through. Fill a similar phial, or any glass receiver K, with water, and invert it after the manner shown above, in a basin HI, about half filled with water. Now put some chalk or marble, grossly powdered, into the bottle E, so as to fill about a fourth or fifth part of it, and upon it pour some water, just enough to cover the chalk; then add some oil of vitriol to it, which needs not be more than about the fourth or fifth part of the water. Immediately after, apply the cork D, with the tube AB, to the bottle, and putting it in the situation FG, let the extremity B of the tube pass through the water of the basin into the neck of the bottle K, which now must be kept up with the hand, or other convenient support, as it cannot rest upon the bottom of the basin. The mixture of chalk, &c. in the bottle FG, will immediately begin to effervesce, showing a frothing, and an intestine motion accompanied with heat, that may be felt by applying the hand to the outside of the fluid. The elastic fluid called *fixed air* is copiously emitted from this mixture, and passing through the bent tube, will go into the bottle K, as appears by the bubbles which come out of the tube, and, passing

Plate VIII.
fig. 1.

Cavillo on
Air.

(A) Chalk, lime-stone, &c. after being kept in a very strong fire for many hours, if they are put into acids, yield a considerable quantity of fixed air; which shows that the purest quick-lime contains some fixed air.

Of Artificial sing through the water, ascend to the top of the inverted bottle. In proportion as the elastic fluid fills the bottle K, the water gradually descends, and at last is quite expelled from it; the bottle K then is filled with fixed air, and being corked under water, may be removed from the basin, and kept for use. Another bottle may then be filled with water, and may be inverted over the extremity of the bent tube in the place of K, which other bottle may be filled in a similar manner, and so on till the mixture in FG has finished to yield any fixed air.

If one of these bottles filled with fixed air, be uncorked, and, holding it with the mouth upwards, a lighted wax-taper, bent like L, or a small piece of it affixed to the extremity of a wire, be immediately let down in it, the flame will be instantly extinguished. The same thing will happen if a lighted piece of wood is let down in it.

Cavallo, on
Air.

Take a clean bowl, and putting the mouth of a bottle, filled with fixed air, in it, uncork it, and keep it in that situation for about a minute. The fixed air being specifically heavier than common air, will come out of the bottle, and will remain at the bottom of the bowl, whilst common air enters into the bottle; which bottle may now be removed; and, in order to show the real existence of the fixed air, which will immediately show its being heavier than common air, put a lighted wax-taper into the bowl, pretty near its bottom, which taper will be extinguished immediately. The air in this experiment must be agitated as little as it is possible. That the flame of the wax-taper was really extinguished by the fixed air, may be easily proved in the following manner:—Blow once or twice into the bowl, by which means the fixed air will be expelled from it; and then, on letting down a lighted wax-taper in it as before, it will be found that it is no longer extinguished, but will burn very well, the bowl being now filled with common air. This experiment never fails of surprising the spectators, as it clearly exhibits two remarkable properties of a fluid, which they can neither see nor distinguish by the feeling.

When the bottle K is about half filled with fixed air, put a mark with a bit of soft wax on the outside of it, just coinciding with the level of the water in it, and immediately after shake the bottle; but taking care that its mouth be not lifted above the surface of the water in the basin. After having shaken it for about a minute, on intermitting the agitation, it will be found that the water is above the mark; which shows that some of the fixed air has been absorbed by it. Let this absorption be carried on as far as possible, by agitating the bottle repeatedly, and allowing time to let more fixed air be produced and enter into the bottle in proportion as the water absorbs it. Then apply the hand, or a finger, to the mouth of the bottle whilst under water; bring the bottle out, and turn it with the mouth upwards. The water then will be found to have acquired a pleasant acidulous taste. The water thus impregnated with fixed air changes the blue infusion of some vegetable substances into red; so that if a weak solution of heliotrope is mixed with it, or indeed if it is simply exposed to fixed air, the liquor acquires a reddish appearance. It also corrodes iron, and some other metals, much more easily than common water. But the greatest and most useful property of

this acidulated water, or water impregnated with fixed air, is its being a powerful antiseptic. As the most used mineral waters are medicinal principally on account of their being impregnated with fixed air, besides which they generally contain some small portion of metal or salt dissolved; they may be imitated by impregnating water with fixed air, and then adding that quantity of salt or of metal, that by analysis the original mineral waters are found to contain.

183
Useful pro-
perties of
fixed air.

It is for its great property of hindering putrefaction, that fixed air by itself, or incorporated with various fluids, especially with water, and that vegetables, sugar, and other substances which abound with fixed air, are very powerful remedies in putrid diseases. Sir John Pringle supposes, with great probability, that the frequent use of sugar and fresh vegetables, which at this time make up a considerable part of the diet of the European nations, prevents those putrid diseases and plagues which formerly were rather frequent.—Dr Macbride, showing experimentally that fixed air is discharged by such substances as form our common food, ascribes the preservation of the body from putrefaction in great measure to the fixed air, which in the ordinary process of digestion is disengaged from the aliment, and incorporates with the fluids of the body.

From the same property it may be also usefully applied to several economical purposes. Mr Henry found, that fixed air can preserve fruit for a considerable time. He tried a bunch of Italian grapes, which being suspended in the middle part of Dr Nooth's apparatus, and being supplied with plentiful streams of fixed air every day, was preserved without any signs of decay for about one month longer than a similar bunch suspended in a decanter containing common air. Strawberries and cherries he also found to be preserved without decay some days longer in fixed than in common air. Indeed, fixed air preserves not only fruit, but resists putrefaction in general. Dr Macbride, in his elegant Essays on Medical and Philosophical Subjects, has published various experiments which demonstrate this property of fixed air. He found, that not only good meat was preserved incorrupt for a considerable time, when exposed to fixed air; but that the putrefaction of substances actually putrid was impeded by this means, and even that those substances were restored from the putrescent to a sound state. That putrefaction was checked by fermentation, was discovered by Sir John Pringle; and Dr Macbride observed, that this effect was owing to the fixed air produced in the act of fermentation. But it must be observed, that when the sound, or even putrid substances, expose a very great surface to the fixed air, as is the case with milk, bile, and other fluids impregnated with fixed air, and also with small bits of meat, then they are preserved for a considerable time: but large pieces of solid animal substances, as for instance roundish pieces of flesh of about half a pound weight, do not seem to remain incorrupt much longer in fixed than in common air; at least the difference is inconsiderable. Sir William Lee, baronet, in two of his letters to Dr Priestley, informs him of his having found, that flesh-meat, even in the hot season, could be preserved wholesome for several days, by only washing it two or three times a-day in water impregnated with fixed

184

Resists pu-
trification.

190

Of Artificial
Airs.

fixed air. "We have been enabled," says he, "to preserve meat as perfectly sweet and good to the extent of ten days, as at the first killing; and there seems no doubt it might be preserved much longer." He has even recovered some meat that had begun to change. This useful discovery, Sir William justly observes, may be very beneficial to the public, especially to butchers. "Particularly a butcher," says he, "who deals pretty largely, assures me he found the greatest success from it, and only objects that the veal was a little discoloured, though kept perfectly sweet."

Fixed air, as it combines with water, so it may be combined with other liquors. Beer, wine, and other fermented liquors, may be impregnated with fixed air, and by this means their sharpness may be restored, when they are become vapid, or, as it is commonly said, *dead*. The acidulous taste communicated by the impregnation of fixed air, cannot be discovered in beer, wines, and, in short, in such liquors which have much taste of their own. Milk acquires an acidulous taste by being impregnated with fixed air, and is thereby preserved incorrupt for some days; which affords a very easy expedient of preserving milk in those places where it cannot be had new very often.

185
Production
of inflam-
mable air.

§ 2. *To produce INFLAMMABLE Air.*—The process for making this sort of gas is the same as that for making fixed air: one of the materials only must be different, viz. iron filings, or grossly powdered zinc, must be used instead of chalk; to which filings some oil of vitriol and water must be added, in the same proportion as in the fixed air, or rather a little more of oil of vitriol.

N. B. Instead of the filings of iron, small nails, or small bits of iron-wire, answer equally well.

The inflammable elastic fluid produced by this mixture has a displeasing smell, even when mixed with a very large quantity of common air; so that if any considerable quantity of it comes out of the bottle, before the cork with the bent tube be applied to it, &c. its smell may be perceived all over the room in which the experiment is made, but this smell is not particularly offensive.

When a bottle has been filled with this elastic fluid, stop the mouth of it with your thumb, or any stopper, and taking it out of the basin, bring it near the flame of a candle; and when the mouth of the bottle is very near it, remove the stopper, and the elastic fluid contained in the bottle will be immediately inflamed; and if the capacity of the bottle is nearly equal to four ounce-measures, it will continue burning quietly for about half a minute, the flame gradually descending lower and lower, as far as about the middle of the bottle, in proportion as the inflammable gas is consumed.

In this experiment we see, that inflammable air follows the general rule of all other combustible substances, namely, that of burning only when in contact with common air: thus the flame of this gas, whilst burning, is observable only on that surface of it which is contiguous to the common air; so that if the bottle be closed, the flame is put out immediately, because the air is intercepted from it. But if the inflammable air were put in such a situation as to expose a very great surface to the common air, it is plain, that by

186
Pheno-
mena.

this means its combustion would be accelerated, so as to let it burn instantly, and go off with an explosion, caused by the sudden rarefaction of the air. In fact, this effect may be easily observed in the following manner: When the bottle is to be inverted into the basin, in order to let it be filled with the inflammable gas, instead of filling it entirely with water, let half of it remain filled with common air; then invert it, and let the other half, which is now filled with water, be filled with inflammable air after the usual manner; and when the bottle is full, remove it in the manner shown above, and approach it to the flame of the candle, by which means the inflammable air takes fire; but now it explodes all at once with a large flame and a considerable report, sometimes breaking the bottle in which it is contained. In this case, the bottle being filled with equal parts of inflammable and common air, these two elastic fluids were mixed together, so that almost every particle of the one touched every particle of the other, and hence the sudden combustion was occasioned. The force of this explosion is so very considerable, that some pistols have been contrived, which are charged with a mixture of air and inflammable gas, and being fired by means of an electric spark, are capable to drive a leaden bullet with great violence. Sometimes those pistols are made of glass (but in this case they are not charged with a bullet), and it is very diverting to show that pistols are charged and explode by the combustion of an invisible substance.

When a slender pipe is tied to the neck of a bladder, and the bladder is filled with inflammable air, after the manner described in the preceding experiment (viz. when the bladder was required to be filled with fixed air), two very pleasing experiments may be performed with it. First, the inflammable gas may be inflamed by applying the flame of the candle to the extremity of the pipe; and squeezing at the same time the bladder, a stream of fire will be formed in the air, which will last as long as the bladder contains any inflammable air; for this gas coming out of the pipe with violence, will continue inflamed for a considerable way in the air. Secondly, the extremity of the pipe may be dipped into a solution of soap, then removing it from the solution, and squeezing the bladder very gently, a ball of soap-water may be formed, including inflammable air: which ball, on account of the inflammable gas being much lighter than common air, as soon as it is detached from the pipe will ascend upwards, and will break by dashing against the ceiling, contrary to those commonly made by children, which in still air go downwards.—Whilst the ball is ascending, if the flame of the candle be approached to it, the film of soap-water will be instantly broke, and the inflammable air will take fire; thus a flame may be shown to be seemingly produced from a soap-ball.

By taking electric sparks in any kind of oil, spirit of wine, ether, or spirit of sal ammoniac, Dr Priestley obtained inflammable air. The oil, or other liquor, was confined in a glass tube by quicksilver, and a wire was cemented in the upper part of the tube, through which the sparks being sent, went to the quicksilver through the oil; but after that a few sparks had been taken, a quantity of inflammable air was generated, &c. Let the production of inflammable air should be attributed to the cement which fastened the

187
Inflamma-
ble air ob-
tained from
various sub-
stances.

Of Artificial the wire, the Doctor repeated the experiment with
Airs. ether in a glass syphon; but the inflammable air was generated as before. This elastic fluid does not lose its inflammability by being passed several times from one vessel into another through water.

Alkaline air, by taking electric explosions in it, is changed into inflammable air.

By means of acids, inflammable air is obtained in greater abundance, and more readily. Iron, zinc, or tin, yield plenty of inflammable air when acted on by diluted vitriolic or marine acids.

If iron is put into strong vitriolic acid, the quantity of elastic fluid that is produced is very little, except heat be applied to the phial, for then the production of elastic fluid is more copious; but this elastic fluid is vitriolic acid air, mixed with a small portion of inflammable air, the proportional quantity of its being less when the acid is more concentrated.

Zinc, treated after the same manner, produces the like effects, except that it gives more elastic fluid, without the application of heat, than iron does; and the greatest part of the produced elastic fluid is inflammable.

In order to obtain the greatest quantity of inflammable air from iron or zinc, the vitriolic acid must be diluted with much water, as about one part of strong oil of vitriol to five or six parts of water. Dr Priestley found, that 11 grains of iron yielded $8\frac{1}{2}$ ounce-measures of inflammable air. According to Mr Cavendish, one ounce of zinc, dissolved either in the vitriolic or marine acid, yields a quantity of inflammable air equal to the bulk of 356 ounces of water; one ounce of iron, dissolved by means of vitriolic acid, yields a quantity of inflammable air equal to the bulk of 412 ounces of water; and one ounce of tin yields half as much inflammable air as iron does.

The solutions of iron, tin, copper, lead, and zinc, in the marine acid, produce marine acid air, and inflammable air, but in various quantities. The proportion of the former to the latter is as one to eight in iron, as one to six in tin, as three to one in copper and lead, and as one to ten in zinc. Regulus of antimony, dissolved in marine acid, with the application of heat, yields a small quantity of elastic fluid, which is weakly inflammable.

Dr Priestley obtained inflammable air, not only by dissolving various substances in marine acid, but also by exposing divers bodies to marine acid air, which is probably the purest part of the marine acid. Having admitted iron-filings to this acid air, they were dissolved by it pretty fast; half of the elastic fluid disappeared, and the rest was rendered unabsorbable by water, and inflammable. The same effect was produced by almost every substance which contains phlogiston, as by spirit of wine, oil of olives, spirit of turpentine, charcoal, phosphorus, bees-wax, sulphur, dry cork-wood, pieces of oak, ivory, pieces of roasted beef, and even some pieces of a whitish kind of flint.

A greater or smaller portion of the acid air was absorbed, and the rest sometimes was all inflammable, and often was partly acid air, which was soon absorbed on the admission of water, and partly inflammable. In short, it seems as if this acid air, having a great affinity with phlogiston, separates it from all those substances which contain it even in small quantity, and from that combination becomes inflammable.

By means of nitrous acid, inflammable air may be obtained from various substances containing phlogiston; but it is always mixed with nitrous air, and sometimes also with fixed and common or phlogisticated air. If two parts of spirit of wine, mixed with one part of nitrous acid, are put into a phial with a ground-stopper and tube, and the flame of a candle be applied to it, so as to heat it gradually, the inflammable air will be produced very readily; the inflammability of which is, however, not very permanent, for by a little washing in water, it may be annihilated. In the solution of most substances in nitrous acid, it generally happens, that the elastic fluid, which is obtained towards the latter end of the process, possesses the property of being inflammable: thus iron, dissolved in nitrous acid, yields nitrous air; but when the nitrous air ceases to be produced, if the heat of a candle be applied to the solution, more elastic fluid will be produced which is inflammable. "The nitrous acid (says Dr Ingenhousz) when mixed with-iron filings in a very diluted state, gives, by the assistance of a moderate degree of heat, a mixture of different airs, partly fixed, partly common air, and partly phlogisticated air. See further the article AEROSTATION.

§ 3. To produce Nitrous Air. This permanently elastic fluid is never found naturally, like fixed or inflammable air, but is entirely artificial.

188⁸
Either silver, copper, brass, iron, mercury, bismuth, Nitrous air
or nickel, when mixed with nitrous acid, yield nitrous is entirely
air in great quantities. Some of them, especially mer-artificial.
cury, require the aid of heat in order to produce the elastic fluid; the flame of a candle applied to the phial is sufficient: but others, especially copper and iron, do not want the application of any heat. Gold, platinum, and the regulus of antimony, when put in aqua-regia, yield nitrous air pretty readily. Among the metals, lead yields nitrous air in the smallest quantity. "I poured (says Dr Priestley) smoking spirit of nitre into a fire with a ground-stopper and tube, containing $1\frac{1}{2}$ ounce-measure filled with small leaden shot, so as to have no common air at all, either in the phial or in the tube; and I placed it so as to receive the air that might come from it in water. After waiting an hour, in which little or no air was produced, I applied the flame of a candle, though not very near to it; and in these circumstances I got about an ounce-measure of air: but upon some water rushing into the phial while the candle was withdrawn, air was produced very plentifully. I collected in all about a quarter of a pint; and might probably have got much more, but that the salt formed by the solution of the lead had so nearly closed up the tube, that I thought proper to discontinue the process. The air, both of the first and of the last produce, was of the same quantity; and so far nitrous, that two measures of common air, and one of this, occupied the space of two measures only; excepting that the very first and very last produce, mixed with common air, took up a little more room than that which I got in the middle of the process. When the air was produced very fast, it was exceedingly turbid, as if it had been filled with a white powder."

189
From what
substances
I got produced.
Among the semi-metals, zinc gives the weakest nitrous air, when dissolved in nitrous acid. The elastic fluid

Of Artificial Airs. fluid produced from it is mostly phlogisticated air. From four pennyweights and 17 grains of zinc, dissolved in spirit of nitre diluted with an equal quantity of water, Dr Priestley obtained about 12 ounce-measures of very weak nitrous air. It occasioned a very slight effervescence when mixed with common air. The Doctor obtained nitrous air even from some flowers of zinc. "Having (says he) mixed a quantity of blue spirit of nitre with flowers of zinc, which were of a dull colour, and appeared from several experiments to contain a portion of phlogiston, it yielded, with the heat of a candle applied to the phial which contained it, strong nitrous air; when the common spirit of nitre, applied in the same manner, gave only phlogisticated air; the phlogiston of which came probably from the calx itself, though a small portion of it might have been in the nitrous acid, which I believe is never entirely free from it."

The quantity of nitrous air that may be obtained from various metals, is difficult to be ascertained, on account of the diversity occasioned by the strength of the acid, the various nature of the metallic substance, and the method of performing the experiments. The following is a table of the produces of nitrous air from various metals, extracted from Dr Priestley's first volume of Experiments and Observations; but which, as the author himself intimates, is far from being very accurate.

dwt.	grs.	
6	0	of silver yielded 17½ ounce-measures.
5	19	of quicksilver, 4½
1	2½	of copper, 14½
2	0	of brass, 21
0	20	of iron, 6
1	5	of bismuth, 4
0	12	of nickel, 4

The various strength of the nitrous acid produces great diversity in the production of nitrous air. Thus, if copper is dissolved in strong nitrous acid, it will not produce the least quantity of nitrous air; but when dissolved in diluted nitrous acid, it produces a great quantity of that elastic fluid. The strong and pale-coloured nitrous acid should be diluted with at least two or three parts of water to one of the acid, for the easy production of nitrous air from copper and mercury.

The briskness of the effervescence, and the production of nitrous air, are promoted by heat, and also by letting the metallic substance present a great quantity of surface to the acids.

For the generality of experiments, no other degree of heat is required than that produced by the effervescence itself, except mercury be used, which requires the application of some heat. When the metal exhibits a very great surface to the acid, as is the case when filings are used, the effervescence and production of nitrous air are often much quicker than can be conveniently managed.

Copper or brass, when clipped into flat bits, each about two or three grains in weight, and about a quarter of a square inch in surface, and when dissolved in nitrous acid properly diluted, yield nitrous air very equably; but if iron be used, the pieces of it should be larger and fewer; in short, it should present a much less surface to the diluted acid; otherwise the increase of heat in the process, and the rapid production of

Nº 5.

elastic fluid, render the operation both difficult and dangerous for the operator.

As the nitrous air is mostly necessary to try the goodness of respirable air, it is of great consequence to make it always of one constant degree of goodness; but this object is answered by dissolving substances of a very homologous nature in the nitrous acid; therefore it is plain, that the metals whose nature is more uniform must be preferred for this purpose. Accordingly, brass yields nitrous air of a more uniform nature than iron: copper is superior to brass; but pure mercury is still superior to copper: and indeed this is the metal which, considering its nature, uniformity of substance, and easy solution, is upon the whole the most useful for this purpose.

It has been generally observed, that solid vegetable substances, when dissolved in nitrous acid, yield more nitrous air than the animal substances, though this nitrous air is not so pure as that obtained from metals.

Sometimes it contains some fixed air, and a good deal of inflammable air, which is mostly produced towards the end of the process. On the other hand, the nitrous air extracted from animal substances generally contains a good deal of phlogisticated air, and sometimes some fixed air. In order to obtain nitrous air from the solution of animal and vegetable substances in nitrous acid, often some degree of heat must be applied to the phial. The acid also sometimes must be very concentrated, and in other cases it must be diluted; but it is hardly worth while, or practicable, to determine with exactness all those particular cases.

To make Nitrous Air.—The metal, viz. copper, brass, or mercury, is first put into the bottle (which, as well as the whole process, is the same as that described for *fixed Air*), so as to fill about one third of the same; then some water is poured into the bottle, so as just to cover the metal-filings; and lastly, the nitrous acid is added, the quantity of which, when strong, should be about one-third or half the quantity of the water. The smell of the nitrous gas is very penetrating and offensive, and occasions a red smoke as soon as it comes into contact with the common air; hence, whenever any of it escapes from the bottle, it may be observed not only by the smell, but also by the slight red colour.

In order to observe the principal property of this elastic fluid, which is that of diminishing the bulk of common air, let a glass tube, closed at one end, and about nine inches long, and half or three quarters of an inch in diameter, be filled with water, and inverted in water; then take a small phial, of about half an ounce-measure, filled with common air, and plunging it under the water contained in the same basin where the inverted tube is kept, let that quantity of air enter into the tube, which will go to the top of it, the water subsiding accordingly. Let a mark be made, either with a file or by sticking soft wax on the tube, just opposite to the surface of the water in it, which will mark how much of the tube is filled by that given measure of air. After the same manner, fill the same small phial (which we shall call the *measure*) again with air; throw that air into the tube, and put a mark on the tube coinciding with the level of the water in it. In this manner let four or five measures be marked on the tube. Now, if three measures of common air are put

Of Artificial
Airs.

190

Pure mer-
cury yields
the best.

Of Artificial
Airs.Of Artificial
Airs.

put into this tube, when filled with water and inverted, they will fill a space of it as far as the third mark. The same thing will happen if three measures of nitrous instead of common air be put in it; but if two measures of common air and one measure of nitrous air, or one measure of the former and two of the latter, be introduced in it, they will fill a space much shorter than the third mark. On the moment that these two kinds of elastic fluids come into contact, a reddish appearance is perceived, which soon vanishes, and the water, which at first nearly reaches the third mark, rises gradually into the tube, and becomes nearly stationary after about two or three minutes; which show that the diminution is effected gradually. See EUDIOMETER.

§ 4. *To procure DEPHLOGISTICATED Air.*—This is no other than exceedingly pure atmospherical air, entirely free from those heterogeneous vapours which contaminate the air we commonly breathe. The easiest method of procuring this air is to put some red-lead into the bottle, together with some good strong oil of vitriol, but without any water. Let the red-lead fill about a quarter of the bottle, and the vitriolic acid be about the same quantity or very little less; then apply the bent tube to the bottle, and proceed in the same manner as above. But it must be remarked, that without heat this mixture of red-lead and vitriolic acid will not give any dephlogisticated air, or it yields an inconsiderable quantity of it; for which reason the flame of a candle (that of a wax-taper is sufficient) must be applied under the bottom of the bottle; which for this purpose must be rather thin, otherwise it will be easily cracked (A). In this manner the red-lead will yield a good quantity of elastic fluid, the greatest part of which is dephlogisticated air; but not the whole quantity of it, for a good portion of fixed air comes out with it. In order to separate the fixed from the dephlogisticated air, the inverted bottle, when filled with the compound of both, as it is emitted from the red-lead, must be shook in the basin for impregnating water with fixed air; by which means the water will absorb the whole quantity of fixed air, and leave the dephlogisticated air by itself.

From every experiment it appears, that dephlogisticated air, if it could be readily obtained, and at a cheap rate, would be a most valuable manufacture. The heat communicated by means of it to burning fuel is incredible.

These are not the only advantages which might be expected from dephlogisticated air. It has been found by experience, that animals will live much longer in this kind of air than in an equal quantity of common air; whence it is supposed, that the breathing of it must be much more healthy, and contribute to longevity much more than the common atmosphere. Nay, there are not wanting some who attribute the longevity of

the Antediluvians to the great purity of the atmosphere at that time; the whole mass being afterwards tainted by the deluge, in such a manner that it could never regain its former purity and salubrity. But all this as yet is mere conjecture; and excepting the single fact, that animals live much longer in a quantity of dephlogisticated than of common air, there is no evidence that the former contributes more to longevity than the latter. Dr Priestley even throws out a conjecture, that the use of dephlogisticated air might perhaps wear out the system much sooner than common air, in the same manner as it consumes fuel much faster than common air. The great quantity, however, even of the purest air, which is requisite to support animal life, and the expence and trouble of the most ready methods of procuring it, have hitherto prevented any fair trial from being made. Yet philosophers, considering the probability there is of this kind of air being salutary in many diseases, have bestowed some pains in attempting to find out methods of procuring it easily and in large quantity; concerning which we have the following observations in Cavallo's Treatise on Air.

“A man makes in general about 15 inspirations in a minute, and takes in about 30 cubic inches of aerial fluid. But the air which has been once inspired is not thereby much injured, and it may be respired again and again; so that, upon a very moderate calculation, and as appears from actual experiments often repeated, we may safely assert, that a person can breathe 400 cubic inches of good ordinary atmospheric air, at least 30 times, without any inconvenience, *i. e.* it would serve for two minutes; after which that air, though much depraved, is still in a state of being breathed, but then it would occasion some uneasiness. Now, supposing the dephlogisticated air employed to be four times more pure than common air, 400 cubic inches of dephlogisticated air would serve for at least 120 respirations or eight minutes.

“But supposing that 30 inches of common air are completely phlogisticated by a single inspiration, and changed for such as is quite fresh, which indeed is the case in common respiration, then 450 cubic inches of common air will be requisite for one minute's respiration, and 27,000 for one hour; and as dephlogisticated air is supposed to be four times as good, the same quantity of it will serve for four hours. Indeed, if we could depend on the assertions of Mr Fontana, that by adding lime-water to absorb the fixed air produced by respiration, an animal can live 30 times as long as without it, no doubt a much smaller quantity would serve.”

But it is certain such assertions cannot be true; because, though the fixed air should be absorbed as soon as produced, the remaining quantity would still be contaminated by phlogiston. Nay, we are informed by Dr Priestley, who repeated Fontana's experiments,

B b

that

(A) In this operation the flame of the candle, when once applied, must be kept continually near it; and when the mixture does not produce any more elastic fluid, or the operation is required to be intermitted, care should be taken to remove the extremity of the bent tube from the water first, and then to take off the flame of the candle from under the bottle; otherwise, if the flame of the candle be first removed, the materials within the bottle condensing by cold, the water immediately enters, which in an instant fills the bottle, and generally breaks it.

Of Artificial
Airs.

that animals *will not* live longer in a quantity of dephlogisticated air when it stands in contact with lime-water, than they will when no lime-water is used. In what manner a difference so enormous can take place, between philosophers in other respects so accurate, we can by no means determine. It is plain, however, that if 27,000 inches of common air are necessary for a person in one hour, the same quantity of dephlogisticated air cannot be breathed longer than four hours, nor even so long, with any real advantage. Mr Cavallo indeed allows only 12,000 inches for four hours; but though this might no doubt sustain life for that time, the person must at best expect nothing from it superior to the common atmosphere, if he was not materially injured by it.

A very ready method of procuring dephlogisticated air in large quantity, is by means of nitre; and on the supposition that 12,000 inches are sufficient for four hours, (or for 40 hours, as he limits the Abbé Fontana's supposition), Mr Cavallo proceeds in the following manner: "The instruments necessary for the production of dephlogisticated air from nitre are the following; viz. earthen retorts, or earthen vessels with a straight neck, somewhat in the shape of Florence flasks, but with a longer neck, these being cheaper than the retorts, and answering as well;—a small furnace, in which the earthen retort must be kept red-hot; a common chimney fire is not sufficient. These furnaces may be very easily made out of large black lead crucibles. The nitre must be put into the retort or other vessel, so as to fill half or nearly three quarters of its belly; then a bent glass tube is luted to the neck of the earthen vessel, in such a manner as not to let any elastic fluid escape into the open air. The best lute or cement for this or similar purposes is made by mixing together whiting and drying oil. The retort being put into the furnace, must be surrounded with lighted charcoal, which is to be supplied according as it wastes: in short, the belly of the retort must be kept quite red-hot, or rather white-hot, for about three hours at least. If, instead of the retort, the other described earthen vessel be used, care should be had to place it with the neck as little inclined to the horizon as possible, lest the nitre should stop the neck and break it." The air is then to be received into large glass jars, as is usual in other experiments on air.

"The retort or other earthen vessel that is used for this purpose cannot serve for more than once, because it generally breaks in cooling; and besides, the decomposed nitre cannot easily be taken out of it. The retort capable of holding a pound of nitre (the quantity necessary for producing 12,000 cubic inches of dephlogisticated air) for this operation, costs at least half-a-crown; the other earthen vessels in the shape of Florence flasks, but with longer necks, cost about 18 d. a-piece, or 2 s.; so that the price of these vessels forms a considerable part of the expence. If glass vessels are employed, the nitre will not yield near so much air, though of a purer sort, because the glass vessels cannot endure such a great fire as the earthen ones. The retorts of metal, or at least of those metals which are most usually employed for this purpose, viz. iron and copper, phlogistificate in a great measure the air as soon as produced. Considering, then, all these circumstances, it appears, that when a person has all the

usual apparatus and furnace, the expences at present necessary in London for the production of 12,000 cubic inches of dephlogisticated air (viz. the price of one pound of nitre, of an earthen retort or other vessel, and of charcoal), amount to about 4 s. or 4 s. 6 d."

Another method of preparing dephlogisticated air is, by blowing that of the common atmosphere through melted nitre. In this process the phlogiston contained in the atmosphere is gradually consumed, by detonating with the acid of the nitre, and therefore issues much more pure than before. This method has the appearance at first of being much easier and more commodious than the former; but as it is impossible to mix the atmospheric air so exactly with the melted nitre that every particle of the one may come in contact with every particle of the other, it is plain that the former method must be preferable; not to mention that it will be found exceedingly troublesome to blow the air through the nitre, as the latter will be perpetually apt to cool and concrete into lumps by the cold blast.

§ 5. *To procure VITRIOLIC Acid Air.*—This consists of the vitriolic acid, united with some phlogiston, which volatilizes and renders it capable of assuming the form of a permanently elastic fluid. To obtain it, some strong concentrated vitriolic acid must be put into the usual bottle, together with some substance capable of furnishing phlogiston. Olive oil answers very well. The oil of vitriol should be about three or four times as much as the sweet oil, and both together should fill about one-third or half the bottle. A gentle degree of heat is then required, in order to let these materials yield any elastic fluid; which may be done by applying the flame of a wax-taper, as directed above for the production of dephlogisticated air.

§ 6. *To procure MARINE Acid Air*, which is no other than the marine acid itself, and which without any addition becomes a permanently elastic fluid; put some sea-salt, or common kitchen salt, into the usual bottle in which the materials for producing elastic fluids are generally put, so as to fill about a fourth part of it, and upon this salt pour a small quantity of good concentrated vitriolic acid; then apply the bent tube to the bottle, and introduce it through the quicksilver into the receiver, filled with and inverted in quicksilver after the usual method, and the elastic fluid is copiously produced.

§ 7. *To procure NITROUS Acid Air.*—This may be obtained from heated nitrous acid, the vapour of which acquires a permanent elasticity, and it has been found to remain uncondensed into a visible fluid by any cold to which it has been hitherto exposed. The great difficulty is to find a fluid capable of confining this acid air; because it is easily and abundantly absorbed by water, which is one of its properties by which it differs from nitrous air. It acts upon quicksilver, and also upon oils: hence its examination cannot be made but very imperfectly; for substances must be exposed to it, or mixed with it, whilst it is actually changing its nature by acting on the mercury or other fluid that confines it.

When water has absorbed a good quantity of this elastic fluid, it acquires the properties of nitrous acid; and when heated, it yields a large quantity of nitrous air,

Of Artificial air, viz. a quantity many times greater than that which water is wont to imbibe of it by agitation, or by any known means.

When the nitrous acid air is combined with essential oils, a considerable effervescence and heat are produced, nearly in the same manner as when the nitrous acid itself is poured upon those oils.

§ 8. *FLUOR Acid Air*.—Put some of those minerals called *fluors*, or *fusible spars*, pulverized, into the usual bottle, and upon it pour some concentrated oil of vitriol; then adapt the bent tube, &c. The fluor acid

air is at first produced without the help of heat; but in a short time it will be necessary to apply the flame of a candle to the bottle, by which means a considerable quantity of this elastic fluid is obtained.

§ 9. *ALKALINE Air*.—Let the usual bottle be about half filled with volatile spirit of sal ammoniac; and after applying the bent tube, &c. let the flame of a candle be brought under the bottle, by which means the alkaline air will be produced copiously.

HEPATIC Air. See Sect. XI. *supra*.

I N D E X.

A.
Aerial acid, a name for fixed air, n° 106.
Air, supposed anciently to be homogeneous, 1. Not so in reality, 2. Has some way of purifying itself, 3. Halley's calculation of the quantity of water evaporated into it from the sea, 4. Dr Watson's of the moisture evaporated from dry ground, *ibid.* How it is purified from the aqueous vapour, 4. From phlogistic vapours, 5. Why a dry air is always wholesome, but a moist one is not, *ibid.* Contaminated in certain places by various kinds of vapours, *ibid.* How purified from vapours heavier than itself, *ibid.* Its specific gravity compared with water, 6. Its pressure as a gravitating fluid, 7. Effects of its gravity on vegetables and animals, *ibid.* Of its elasticity, 8. Whether this can be impaired, 9. Its elasticity is always in proportion to its density, *ibid.* How far a quantity of air may be compressed, 10. Is capable of vast dilatation by its elastic force, *ibid.* In what proportion it is expanded by heat, 11. Its elasticity supposed to be the cause of earthquakes, *ibid.* Effects of its elasticity on various bodies, 12. Great solvent power of the air, 13. Its chemical effects, 15. Air contained in mineral waters, 19, 20. Decomposed in the calcination of metals, 29. Is not diminished in common cases of combustion, 58. A kind of air procured from solution of gold, 175.

Alkaline air: Its properties, 146. Contains phlogiston, 147. Converted into inflammable air, 148.

Animals: Cause of their death in dephlogisticated air, 61. Effects of inflammable air on them, 141.

Arsenic: Inflammable air produced from by the red-hot steam of water, 124.

Ashes gain most of their weight by absorption from the atmosphere, 122.

Atmosphere consists of two very different kinds of fluids, 24, 93. The proportions of these, 178. The upper parts of it more salubrious than the lower, 179.

B.
Black's (Dr) discoveries, 21. His theory concerning fixed air attacked at first, but now universally received, 23. *Boyle's* discoveries, 17.

C
Calcination of metals: Mr Lavoisier's experiments on it, 92. His conclusions therefrom with regard to the composition of atmospherical air, 93.

Cast iron: Remarkable phenomenon attending its calcination with a burning-glass, 70.

Cavallo's conclusions from Dr Ingenhousz's experiments, 38. His method of collecting inflammable air from ponds, 119.

Cavendish's experiments on water, 75. On the production of nitrous acid, 101, 102.

Charcoal yields a great quantity of fixed air, 16.—totally convertible into inflammable air

129. Its excessive attraction for water, 132.

Combustion, whether common air is diminished by it, 58, 183.

Contagion of the plague, of a heavy sluggish nature, 5.

Copper: Dr Priestley's experiments to produce water by its means, 73. Is not affected by alkaline air, 146.

Cotton-wool: Quantity of dephlogisticated air produced by its means from water, 45.

Cretaceous acids: An improper name for fixed air, 107.

D.
Darkness: Its effects on the production of air, 42.

Dephlogisticated air discovered by Dr Priestley, 24. First obtained by means of a burning-glass from precipitate *per se*, 25. Why called dephlogisticated, 26. Produced from a great variety of substances, *ibid.* Discovered by Mr

Scheele, 28. May be obtained without the use of nitrous acid, 29. Produced in greatest quantities by a sudden and violent heat, 30. Method of procuring it from different substances, 31. How it is produced by nature, 32. Method of obtaining it from water, 36. From the leaves of plants, 37. By means of raw silk, 41. From various other substances, 45. Quantity of it produced from water, 46. Of the cause of its production, 47. At what times it is produced of the best quality, 48. Found in sea-water, 53. How to preserve it in large quantity, 54. It produces intense heat, 55.

Explodes violently with inflammable air, 56. Burns violently with pyrophorus, 57. Is diminished by combustion, 59,—and by nitrous air, 60, 154. In what manner it may be contaminated, 61. Does not support vegetation, 62. Of its component parts, 63. Does not contain earth, 65. Whether it contains any nitrous acid, 66. Imbibed by calces of metals, 67. By iron, 68. Mr Cavendish's experiments on its composition, 75. Nitrous acid produced from a mixture of it and inflammable air, 77. Supposed to be one of the component parts of water, 81, 82, 83. Effects of the electric spark on it when inclosed between different liquors, 105. Dr Priestley's experiments on the production of fixed air from it, 110.

Dephlogisticated nitrous air, how procured, 160. Its component parts, 161. Best method of procuring it, 163. Made to approach to the nature of atmospherical air, 164.

Diminution of air, supposed to be owing to phlogiston emitted into it, 89.

E.
Earth is not a component part of dephlogisticated air, 65.

Effervescence between acids and alkalis occasioned by fixed air in the latter, 21.

Eider-down: Dephlogisticated air produced by its means from water, 45.

Electric spark: Its effects on dephlogisticated air inclosed between

tween different liquors, 105. On fixed air, 113. On nitrous air, 159.

F.

Fermentation: Why it will not go on in *vacuo*, 12.

Fermented liquors restored from a vapid state by adding fixed air to them, 180.

Finery-cinder, the same with scales of iron, consists of the metal united with dephlogisticated air, 124.

Fire supposed to be the cause of the air's elasticity, 11.

Fixed air contained in absorbent earths and alkaline salts, 21. Its proportion in these substances, 22. Effervescence of these substances with acids occasioned by fixed air, 21. Increases the weight of metallic precipitates, 21. Supposed to be the principle of union in terrestrial bodies, *ibid.* Separated from fermenting and putrefying substances, 21. Dissolves earths and metals, 22. Formed by the union of phlogiston with dephlogisticated air, 67. Found in a great variety of substances, 106. Specific gravity, and other properties of this kind of air, 107, 108. Its constituent principles, 109. Dr Priestley's experiments on its composition, 110. Proportion of it produced from dephlogisticated air, 112. Effects of the electric spark on it, 113. Of a strong heat on it, 115. Quantity of it expelled from different substances, 116. Generated in the decomposition of inflammable air, 135. Convertible into inflammable air, 136. Great quantities produced by fermenting substances, 180. Proportions contained in different kinds of wines, 181. Emitted by putrefying matters, 182.

Fontana, Abbè: Effects of his breathing inflammable air, 141.

French philosophers, their experiments on the composition of water, 82.

Fur of a Russian hare produces dephlogisticated air with water, 45.

G.

Gold: A peculiar kind of air produced from its solution,

175. A beautiful experiment with it, *ibid.* Green matter observed by Dr Priestley in glass jars producing dephlogisticated air, proved to be of an animal nature, 40.

H.

Hales, Dr, his discoveries, 18, 19.

Heat: Its effects on fixed air, 115.

Hepatic air, produced from an ore of zinc, 176.

Best obtained from liver of sulphur, 177. Its properties, *ibid.*

Hot climates: Great quantity of inflammable air produced in them, 118.

Human hair produces dephlogisticated air with water, 45.

I.

Ice dissolved very fast by alkaline air, 146. And by marine acid air, 171.

Incondensable vapour arising from water, 86. Priestley's conjectures concerning it, 87. Attempts to collect it, 88.

Inflammable air: Method of burning it in the dephlogisticated kind, 59. Water produced from a mixture of inflammable and dephlogisticated air, 77. Quantity of it necessary to phlogisticate common air, 78. This kind of air produced in mines, from putrid waters, &c. 117. Great quantities generated in hot climates, 118. Mr Cavallo's method of collecting it from ponds, 119. Meteors thought to be produced by it, 120. Different kinds of inflammable air, 121. Extracted from various substances by heat, 122. More air procured by a sudden and violent than by a gradual heat, 123. How procured from water and other fluid and solid substances, 124. Proportions of inflammable air procured from iron by means of steam, 125. Of the constituent parts of inflammable air, 126. No acid contained in it, 127. Water necessary to its production according to Dr Priestley, 128. Denied by Mr Kirwan, 138. Charcoal totally convertible into it, 129. Experiment showing the neces-

sity of water for the production of inflammable air, 131. Is not pure phlogiston, 133. Priestley's analysis of different kinds of it, 134. Fixed air generated in its decomposition, 135. Fixed air convertible into it, 136. Has a great propensity to unite with water, 137. Dr Priestley's conclusion with regard to its component parts, 139. Its absorption by water, 140. Its effects on vegetation and animal life, 141. Has little refractive power, 142. Schemes to employ it for various purposes, 143.

Ingenhousz, Dr, his experiments in the melioration of air by vegetation, 35. Produces dephlogisticated air from water by means of the leaves of plants, 37. Conclusions from his experiments, 38. His theory disputed, 51.

Iron sometimes dissolved by the air, 13. Yields dephlogisticated air with oil of vitriol, 31. Imbibes dephlogisticated air, 68. Takes it from the atmosphere, 69. May be made to imbibe dephlogisticated air as often as we please, 74. Properties of the inflammable air obtained from it by means of steam, 125.

K.

Kirwan's conclusion concerning the artificial production of water, 83. Observes the propensity of inflammable air to unite with water, 137. His opinion concerning the constituent principles of inflammable air, 138.

L.

Lavoisier corrects a process of Dr Priestley, 31. His experiments on the diminution of air by burning, 58, 59. Differences betwixt him and Dr Priestley, 64. Denies the existence of phlogiston, 91. His experiments on the calcination of metals and respiration, 92, 93, 94.

Lead: Proportions of it revived in alkaline air, 147.

Leaves of plants separate dephlogisticated air from water, 37. Resume this property after they seem to have lost it, 52.

Light: Effects of it in the pro-

duction of dephlogisticated air, 36. Effects of light without heat, 43. Of artificial light, 44.

Lint produces dephlogisticated air, 45.

Litmus, its solution decomposed by taking the electric spark in dephlogisticated air confined over it, 105.

Liver of sulphur absorbs dephlogisticated air, 95. Yields hepatic air in plenty, 177.

M.

Manganese: Sulphurated inflammable air first produced from it, 144.

Marble, why it sometimes bursts with frost, 5.

Marine acid air, how procured, 170. Its properties, 171. Changed into inflammable air, 172.

Mediterranean sea: Quantity of water evaporated from its surface, 4.

Metallic vapours, their poisonous qualities, 5.

Metallic calces imbibe dephlogisticated air, 67.

Mercury yields dephlogisticated air either with nitrous or vitriolic acid, 31.

Mineral waters contain air, 19, 20.

Mint restores noxious air to a state of salubrity by its vegetation, 32, 33.

Mofetes, their nature, 5.

Mustard, its effects on air, 35.

N.

Nitre yields a great quantity of dephlogisticated air, 28.

Nitrous air diminishes dephlogisticated air, 60, 154. Yields nitrous acid when decomposed, 76. How procured, 150. Why strong nitrous acid yields none, 151. Properties of it, 152. Extremely fatal to vegetable and animal life, 153. Has a strong antiseptic power, 155. Its specific gravity, 156. Its component parts, 157. Composed of phlogisticated nitrous acid and water, 158. Effects of the electric spark on it, 159.

Nitrous acid, whether or not it enters the composition of nitrous air, 66. Produced from dephlogisticated and inflammable air, 77.

Nitrous acid air, how procured, 166. Cannot be preserved,

served by means of any fluid, 167. Assumes a red colour by being heated, 168. Its effects on red lead, 169. *Noxious air*, how purified by agitation in water, 97.

O.

Oils and Salts, why they separate *in vacuo*, 7.

Olive oil, with whiting, yields inflammable air, 124.

P.

Phlogisticated air, its properties, 99. Nitrous acid procured by means of it, 100. Mr Cavendish's opinions on its nature, 103.

Phlogistication of air, whether it produces any vitriolic acid, 76. Explained, 89.

Phlogiston, too great powers attributed to it, 90. Its existence denied by the foreign chemists, 91. Whether inflammable air is pure phlogiston or not, 133, 138. Contained in alkaline air, 147.

Plants purify air by their vegetation, 38.

Populus nigra, dephlogisticated air plentifully produced from water by means of its cotton-like substance, 46, 47.

Precipitate per se, yields no water on being revived into a metal, 73.

Priestley, Dr, discovers dephlogisticated air, 24. His first hypothesis concerning the component parts of dephlogisticated air, 63. Difference betwixt some of his experiments and those of Lavoisier, 64. His opinion con-

cerning the non-existence of nitrous acid in dephlogisticated air, 66. Difficulties arising from some of his experiments concerning the generation of water in deflagrating dephlogisticated and inflammable air, 85. His conjectures concerning the incondensable vapour of water, 87. His experiments on the composition of fixed air, 110. His opinion concerning the composition of phlogisticated air, 111. Experiment in favour of his hypothesis concerning phlogisticated air, 114.

Putrefying substances emit fixed air, 182.

R.

Raw-silk produces dephlogisticated air by means of water, 41. Various substances substituted for it, 45. Comparison between its surface and that of the cotton-like substance of the *Populus nigra*, 47.

Red-lead yields no dephlogisticated air when first prepared, and but little for some time after, 29. Gives a greater quantity by a sudden than a slow heat, 30.

Respiration, Mr Lavoisier's experiments on it, 91.

Retorts with long necks proper for distilling dephlogisticated air, 31.

S.

Scales of iron the same with finery-cinder, 124.

Scheele discovers dephlogisticated air, 28. His experiments

on its diminution by combustion, 59. On the component parts of the atmosphere, 24.

Sea-water contains pure air, 53.

Seltzer-water imitated by Mr Venel, 20.

Sheep's wool separates dephlogisticated air from water, 45.

Soot yields pure air by distillation, 87.

Sponge imbibes a great quantity of alkaline air, 146.

Spun-glass, unsuccessful attempt to procure dephlogisticated air from water by its means, 49.

Steam, proportions of inflammable air obtained by its means from different substances, 125. Its influence on the production of inflammable air from charcoal, 132.

Stones sometimes dissolved by the air, 14.

Sulphureous vapours, their pernicious effects, 5.

Sulphur yields inflammable air with steam, 124.

Sulphurated inflammable air procured from manganese, 144. and from iron melted in vitriolic acid air, 145.

T.

Thomson, Sir Benjamin, his experiments on the production of dephlogisticated air, 39 *et seq.*

Turpentine oil yields inflammable air, 124.

V.

Vegetation will not go on *in vacuo*, and why, 12. Produces dephlogisticated air, 32. Improves noxious air, 33.

Experiments seemingly contradictory, 34. Dr Ingenhousz's experiments on this subject, 35.

Van Helmont's discoveries, 16.

Vegetable acid air phlogisticates common air, 174.

Vitriolic acid air, 165.

Volatile alkali produced from nitrous acid and iron, 149.

W.

Water, quantity of it evaporated from the Mediterranean, 4. From an acre of ground, *ibid.* Why it boils violently *in vacuo*, 7. Produces dephlogisticated air, 36. Quantity of air yielded by it, with the mixture of various substances, 46. By water alone, 50. Formed by the deflagration of inflammable and dephlogisticated air, 71. Quantity produced in this manner, 72, 73. Cavendish's experiments on this subject, 75. Dr Priestley's experiments on the same, 80, 81. Experiments of the French philosophers and Mr Kirwan, 82, 83. Water pervious to air, 98. Method of procuring inflammable air by its means, 124. Always necessary to the production of this kind of air, 128, 131. Attraction betwixt it and burning charcoal or iron, 132. Great propensity of inflammable air to unite with it, 137, 140. Its effects on nitrous air, 162.

Wines, proportions of fixed air in different kinds of them, 182.

A E R

AEROMANCY, a species of divination performed by means of air, wind, &c. See DIVINATION, n° 5.

AEROMETRY, the science of measuring the air. It comprehends not only the doctrine of the air itself, considered as a fluid body; but also its pressure, elasticity, rarefaction, and condensation. But the term is at present not much in use, this branch of natural philosophy being more frequently called Pneumatics. See PNEUMATICS.

AERONAUT, a person who attends and guides an air-balloon. See AEROSTATION and AIR-Balloon.

AERONAUTICA, from *αἰρ*, and *ναυτικός*, derived from *ναύς*, *ship*; the art of sailing in a vessel or machine

A E R

through the atmosphere, sustained as a ship in the sea. See AEROSTATION.

AEROPHYLACEA, a term used by naturalists for caverns or reservoirs of air, supposed to exist in the bowels of the earth. Kircher speaks much of aerophylacea, or huge caverns, replete with air, disposed under ground; from whence, through numerous occult passages, that element is conveyed either to subterraneous receptacles of water, which, according to him, are hereby raised into springs or rivers, or into the funds of subterraneous fire, which are hereby fed and kept alive for the reparation of metals, minerals, and the like.

Aerophylacea.

AEROSTATION

A E R O S T A T I O N

IS a science newly introduced into the Encyclopædia. The word, in its primitive sense, denotes the science of suspending weights in the air; but in its modern acceptation, it signifies *aerial navigation*, or the art of navigating through the atmosphere. Hence also the machines which are employed for this purpose are called *aerostats*, or *aerostatic machines*; and from their globular shape, *air balloons*.

The romances of almost every nation have recorded instances of persons being carried through the air, both by the agency of spirits and by mechanical inventions; but till the time of the celebrated Lord Bacon, no rational principle appears ever to have been thought of by which this might be accomplished. Before that time, indeed, Friar Bacon had written upon the subject; and many had been of opinion, that, by means of artificial wings, fixed to the arms or legs, a man might fly as well as a bird: but these opinions were thoroughly refuted by Borelli in his treatise *De Motu Animalium*, where, from a comparison between the power of the muscles which move the wings of a bird, and those which move the arms of a man, he demonstrates that the latter are utterly insufficient to strike the air with such force as to raise him from the ground. It cannot be denied, however, that wings of this kind, if properly constructed, and dexterously managed, might be sufficient to break the fall of a human body from an high place, so that some adventurers in this way might possibly come off with safety; though by far the greatest number of those who have rashly adopted such schemes, have either lost their lives or limbs in the attempt.

In the year 1672, Bishop Wilkins published a treatise, intitled, *The Discovery of the New World*; in which he mentions, though in a very indistinct and confused manner, the true principle on which the air is navigable; quoting, from Albertus de Saxonia and Francis Mendoca, "that the air is in some part of it navigable: and upon this static principle, any brass or iron vessel (suppose a kettle), whose substance is much heavier than that of water, yet being filled with the lighter air, it will swim upon it and not sink. So suppose a cup or wooden vessel upon the outward borders of this elementary air, the capacity of it being filled with fire, or rather ethereal air, it must necessarily, upon the same ground, remain swimming there, and of itself can no more fall than an empty ship can sink." This idea, however, he did not by any means pursue, but rested his hopes entirely upon mechanical motions, to be accomplished by the mere strength of a man, or by springs, &c. and which have been demonstrated incapable of answering any useful purpose.

The only person who brought his scheme of flying to any kind of rational principle was the Jesuit Francis Lana, cotemporary with Bishop Wilkins. He, being acquainted with the real weight of the atmosphere, justly concluded, that if a globular vessel were exhausted of air, it would weigh less than before; and consid-

dering that the solid contents of vessels increase in much greater proportion than their surfaces; he supposed that a metalline vessel might be made so large, that, when emptied of its air, it would be able not only to raise itself in the atmosphere, but to carry up passengers along with it; and he made a number of calculations necessary for putting the project in execution. But though the theory was here unexceptionable, the means proposed were certainly insufficient to accomplish the end: for a vessel of copper, made so thin as was necessary to make it float in the atmosphere, would be utterly unable to resist the external pressure; which being demonstrated by those skilled in mechanics, no attempt was made on that principle.

In the year 1709, however, as we were informed by a letter published in France in 1784, a Portuguese projector, Friar Guffman, applied to the king for encouragement to his invention of a flying machine. The principle on which this was constructed, if indeed it had any principle, seems to have been that of the paper kite. The machine was constructed in form of a bird, and contained several tubes through which the wind was to pass, in order to fill a kind of sails, which were to elevate it; and when the wind was deficient, the same effect was to be performed by means of bellows concealed within the body of the machine. The ascent was also to be promoted by the electric attraction of pieces of amber placed in the top, and by two spheres inclosing magnets in the same situation.

These childish inventions show the low state of science at that time in Portugal, especially as the king, in order to encourage him to farther exertions in such an useful invention, granted him the first vacant place in his college of Barcelos or Santarem, with the first professorship in the university of Coimbra, and an annual pension of 600,000 reis during his life. Of this De Guffman, it is also related, that in the year 1736, he made a wicker basket of about seven or eight feet diameter, and covered with paper, which raised itself about 200 feet in the air, and the effect was generally attributed to witchcraft.

In the year 1766, Mr Henry Cavendish ascertained the weight and other properties of inflammable air, determining it to be at least seven times lighter than common air. Soon after which, it occurred to Dr Black, that perhaps a thin bag filled with inflammable air might be buoyed up by the common atmosphere; and he thought of having the allantois of a calf prepared for this purpose: but his other avocations prevented him from prosecuting the experiment. The same thought occurred some years afterwards to Mr Cavallo; and he has the honour of being the first who made experiments on the subject. He first tried bladders; but the thinnest of these, however well scraped and prepared, were found too heavy. He then tried Chinese paper; but that proved so permeable, that the vapour passed through it like water through a sieve. His experiments, therefore, made in the year 1782, proceeded

1
Lord Bacon first published the true principles of aerostation.

2
Impossibility of flying by mechanical means.

3
Scheme of Bishop Wilkins and Albertus de Saxonia.

4
Bishop Lana's scheme.

5
Strange proposal of Friar Guffman.

6
Possibility of bodies rising in the air thought of by Dr Black and Mr Cavallo.

7
Aerostation
discovered
by Mont-
golfier.

ed no farther than blowing up soap-bubbles with inflammable air, which ascended rapidly to the ceiling, and broke against it.

But while the discovery of the art of aerostation seemed thus on the point of being made in Britain, it was all at once announced in France, and that from a quarter whence nothing of the kind was to have been expected. Two brothers, Stephen and John Montgolfier, natives of Annonay, and masters of a considerable paper-manufactory there, had turned their thoughts towards this project as early as the middle of the year 1782. The idea was first suggested by the natural ascent of the smoke and clouds in the atmosphere; and their design was to form an artificial cloud, by inclosing the smoke in a bag, and making it carry up the covering along with it. Towards the middle of November

8
Account of
his experi-
ments.

that year, the experiment was made at Avignon with a fine silk bag of a parallelopiped shape. By applying burning paper to the lower aperture, the air was rarefied, and the bag ascended in the atmosphere, and struck rapidly against the ceiling. On repeating the experiment in the open air, it rose to the height of about 70 feet.

An experiment on a more enlarged scale was now projected; and a new machine, containing about 650 cubic feet, was made, which broke the cords that confined it, and rose to the height of about 600 feet. Another of 35 feet in diameter rose about 1000 feet high, and fell to the ground three quarters of a mile from the place where it ascended. A public exhibition was next made on the 5th of June 1783, at Annonay, where a vast number of spectators assembled. An immense bag of linen, lined with paper, and containing upwards of 23,000 cubic feet, was found to have a power of lifting about 500 pounds, including its own weight. The operation was begun by burning chopped straw and wool under the aperture of the machine, which immediately began to swell; and after being set at liberty ascended into the atmosphere. In ten minutes it had ascended 6000 feet; and when its force was exhausted, it fell to the ground at the distance of 7668 feet from the place from whence it set out.

Soon after this, one of the brothers arrived at Paris, where he was invited by the academy of sciences to repeat his experiments at their expence. In consequence of this invitation, he constructed, in a garden in the Fauxbourg of St Germain, a large balloon of an elliptical form. In a preliminary experiment, this machine lifted up from the ground eight persons who held it, and would have carried them all off if more had not quickly come to their assistance. Next day the experiment was repeated in presence of the members of the academy; the machine was filled by the combustion of 50 pounds of straw made up in small bundles, upon which about 12 pounds of chopped wool were thrown at intervals. The usual success attended this exhibition: The machine soon swelled; endeavoured to ascend; and immediately after sustained itself in the air, together with the charge of between 4 and 500 pounds weight. It was evident that it would have ascended to a great height; but as it was designed to repeat the experiment before the king and royal family at Versailles, the cords by which it was tied down were not cut. But in consequence of a violent rain and wind which happened at this time, the machine was

so far damaged, that it became necessary to prepare a new one for the time that it had been determined to honour the experiment with the royal presence; and such expedition was used, that this vast machine, of near 60 feet in height and 43 in diameter, was made, painted with water-colours both within and without, and finely decorated, in no more than four days and four nights. Along with this machine was sent a wicker cage, containing a sheep, a cock, and a duck, which were the first animals ever sent through the atmosphere. The full success of the experiment was prevented by a violent gust of wind which tore the cloth in two places near the top before it ascended: However, it rose to the height of 1440 feet; and after remaining in the air about eight minutes, fell to the ground at the distance of 10,200 feet from the place of its setting out. The animals were not in the least hurt.

9
Some ani-
mals safely
sent thro'
the air.

The great power of these aerostatic machines, and their very gradual descent in falling to the ground, had originally showed that they were capable of transporting people through the air with all imaginable safety; and this was further confirmed by the experiment already mentioned. As Mr Montgolfier, therefore, proposed to make a new aerostatic machine of a firmer and better construction than the former, Mr Pilatre de Rozier offered himself to be the first aerial adventurer.

10
Mr Pilatre
de Rozier
the first ae-
rial naviga-
tor.

This new machine was constructed in a garden in the Fauxbourg of St Antoine. It was of an oval shape, about 48 feet in diameter and 74 in height; elegantly painted on the outside with the signs of the zodiac, ciphers of the king's name, and other ornaments. A proper gallery, grate, &c. were appended in the manner afterwards described; so that it was easy for the person who ascended to supply the fire with fuel, and thus keep up the machine as long as he pleased. The weight of the whole apparatus was upwards of 1600 pounds. The experiment was performed on the 15th of October 1785. Mr Pilatre having placed himself in the gallery, the machine was inflated, and permitted to ascend to the height of 84 feet, where he kept it afloat for about four minutes and a half; after which it descended very gently: and such was its tendency to ascend, that it rebounded to a considerable height after touching the ground. Two days after, he repeated the experiment with the same success as before; but the wind being strong, the machine did not sustain itself so well as formerly. On repeating the experiment in calmer weather, he ascended to the height of 210 feet. His next ascent was 262 feet; and in the descent, a gust of wind having blown the machine over some large trees of an adjoining garden, Mr Pilatre suddenly extricated himself from so dangerous a situation, by throwing some straw and chopped wool on the fire, which raised him at once to a sufficient height. On descending again, he once more raised himself to a proper height by throwing straw on the fire. Some time after, he ascended in company with Mr Girond de Villette to the height of 330 feet; hovering over Paris at least nine minutes in sight of all the inhabitants, and the machine keeping all the while perfectly steady.

11
Account of
his differ-
ent voya-
ges.

These experiments had shown, that the aerostatic machines might be raised or lowered at the pleasure of the

the persons who ascended: they had likewise discovered, that the keeping them fast with ropes was no advantage; but, on the contrary, that this was attended with inconvenience and hazard. On the 21st of November 1783, therefore, M. Pilatre determined to undertake an aerial voyage in which the machine should be fully set at liberty. Every thing being got in readiness, the balloon was filled in a few minutes; and M. Pilatre placed himself in the gallery, counterpoised by the Marquis d'Arlandes, who occupied the other side. It was intended to make some preliminary experiments on the ascending power of the machine: but the violence of the wind prevented this from being done, and even damaged the balloon essentially; so that it would have been entirely destroyed had not timely assistance been given. The extraordinary exertions of the workmen, however, repaired it again in two hours, and the adventurers set out. They met with no inconvenience during their voyage, which lasted about 25 minutes; during which time they had passed over a space of above five miles.—From the account given by the Marquis d'Arlandes, it appears that they met with several different currents of air; the effect of which was, to give a very sensible shock to the machine, and the direction of the motion seemed to be from the upper part downwards. It appears also that they were in some danger of having the balloon burnt altogether; as the Marquis observed several round holes made by the fire in the lower part of it, which alarmed him considerably, and indeed not without reason. However, the progress of the fire was easily stopped by the application of a wet sponge, and all appearance of danger ceased in a very short time.

12
Montgolfier's machines succeeded by those filled with inflammable air.

13
Experiment of Messrs Charles and Roberts.

This voyage of M. Pilatre and the Marquis d'Arlandes may be said to conclude the history of those aerostatic machines which are elevated by means of fire; for though many other attempts have been made upon the same principle, most of them have either proved unsuccessful or were of little consequence. They have therefore given place to the other kind, filled with inflammable air; which, by reason of its smaller specific gravity, is both more manageable, and capable of performing voyages of greater length, as it does not require to be supplied with fuel like the others. This was invented a very short time after the discovery had been made by M. Montgolfier. This gentleman had indeed designed to keep his method in some degree a secret from the world; but as it could not be concealed, that a bag filled with any kind of fluid lighter than the common atmosphere would rise in it, inflammable air was naturally thought of as a proper succedaneum for the rarefied air of M. Montgolfier. The first experiment was made by two brothers Messrs Roberts, and M. Charles a professor of experimental philosophy. The bag which contained the gas was composed of lutestring, varnished over with a solution of the elastic gum called *caoutchouc*; and that with which they made their first essay was only about 13 English feet in diameter. Many difficulties occurred in filling it with the inflammable air, chiefly owing to their ignorance of the proper apparatus; insomuch, that, after a whole day's labour from nine in the morning, they had got the balloon only one third part full. Next morning they were surprised to find that it had

N^o 5.

fully inflated of itself during the night: but upon inquiry, it was found, that they had inadvertently left open a stop-cock connected with the balloon, by which the common air gaining access, had mixed itself with the inflammable air; forming a compound still lighter than the common atmosphere, but not sufficiently light to answer the purposes of aerostation. Thus they were obliged to renew their operation; and, by six o'clock in the evening of next day, they found the machine considerably lighter than the common air; and, in an hour after, it made a considerable effort to ascend. The public exhibition, however, had been announced only for the third day after; so that the balloon was allowed to remain in an inflated state for a whole day; during which they found it had lost a power of ascent equal to about three pounds, being one seventh part of the whole. When it was at last set at liberty, after having been well filled with inflammable air, it was 35 pounds lighter than an equal bulk of common air. It remained in the atmosphere only three quarters of an hour, during which it had traversed 15 miles. Its sudden descent was supposed to have been owing to a rupture which had taken place when it ascended into the higher regions of the atmosphere.

The success of this experiment, and the aerial voyage made by Messrs Rozier and Arlandes, naturally suggested the idea of undertaking something of the same kind with a balloon filled with inflammable air. The machine used on this occasion was formed of gores of silk, covered over with a varnish made of *caoutchouc*, of a spherical figure, and measuring $27\frac{1}{2}$ feet in diameter. A net was spread over the upper hemisphere, and was fastened to an hoop which passed round the middle of the balloon. To this a sort of car, or rather boat, was suspended by ropes, in such a manner as to hang a few feet below the lower part of the balloon; and, in order to prevent the bursting of the machine, a valve was placed in it; by opening of which some of the inflammable air might be occasionally let out. A long silken pipe communicated with the balloon, by means of which it was filled. The boat was made of basket-work, covered with painted linen, and beautifully ornamented; being 8 feet long, 4 broad, and $3\frac{1}{2}$ deep; its weight 130 pounds. At this time, however, as at the former, they met with great difficulties in filling the machine with inflammable air, owing to their ignorance of the most proper apparatus. But at last, all obstacles being removed, the two adventurers took their seats at three quarters after one in the afternoon of the first of December 1783. Persons skilled in mathematics were conveniently stationed with proper instruments to calculate the height, velocity, &c. of the balloon. The weight of the whole apparatus, including that of the two adventurers, was found to be $604\frac{1}{2}$ pounds, and the power of ascent when they set out was 20 pounds; so that the whole difference betwixt the weight of this balloon and an equal bulk of common air was 624 pounds. But the weight of common atmosphere displaced by the inflammable gas was calculated to be 771 pounds, so that there remains 147 for the weight of the latter; and this calculation makes it only $5\frac{1}{4}$ times lighter than common air.

At the time the balloon left the ground, the thermometer stood at 9° of Fahrenheit's scale, and the quicksilver in the barometer at 30.18 inches; and, by means

14
In what manner a balloon partly filled may inflate itself.

15
Loss of power in their balloon.

16
First aerial voyage of Messrs Charles and Roberts.

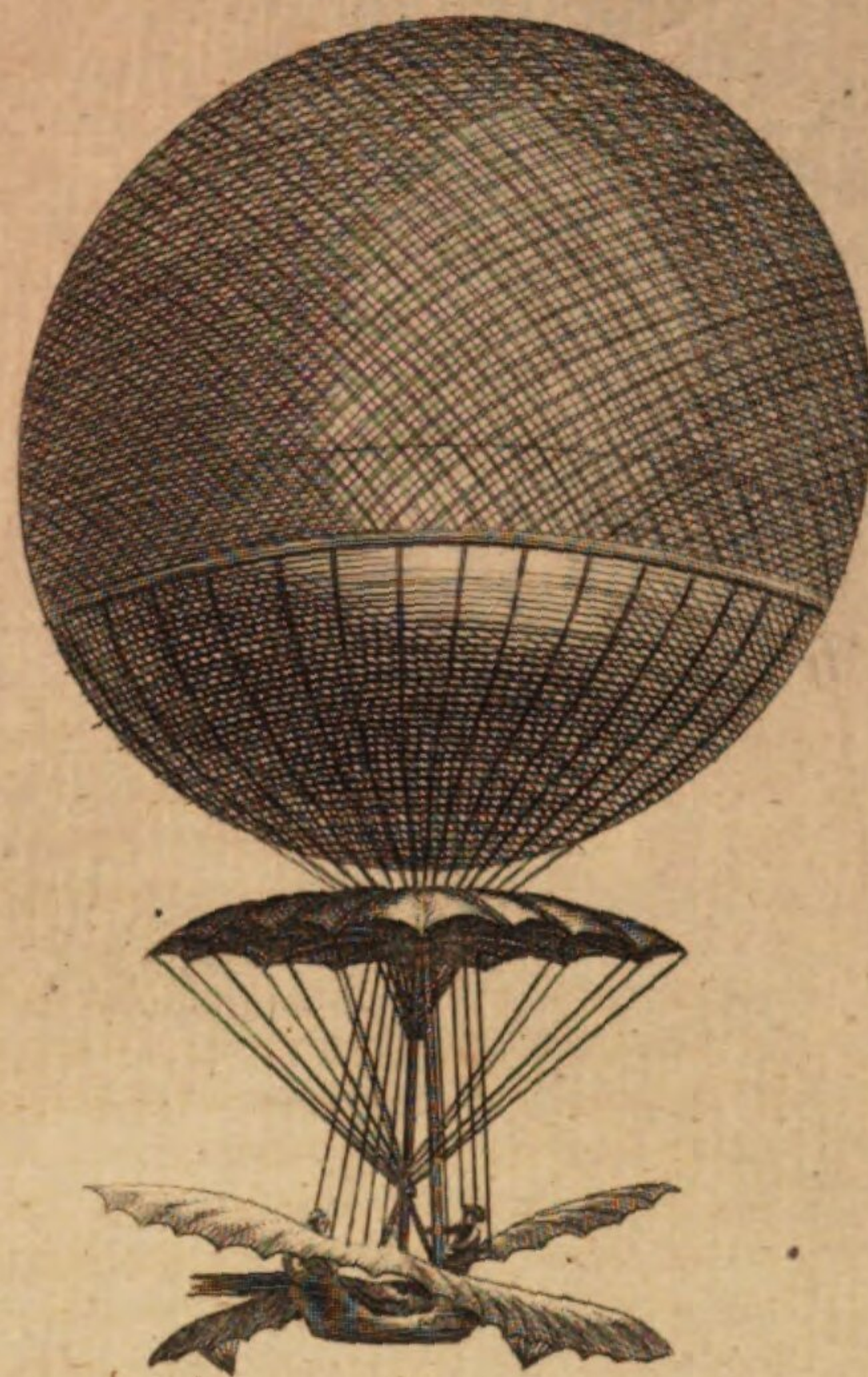
17
Specific gravity of the inflammable air in this first voyage.

Montgolfier's Balloon.
Sauvbourg St Antoine.

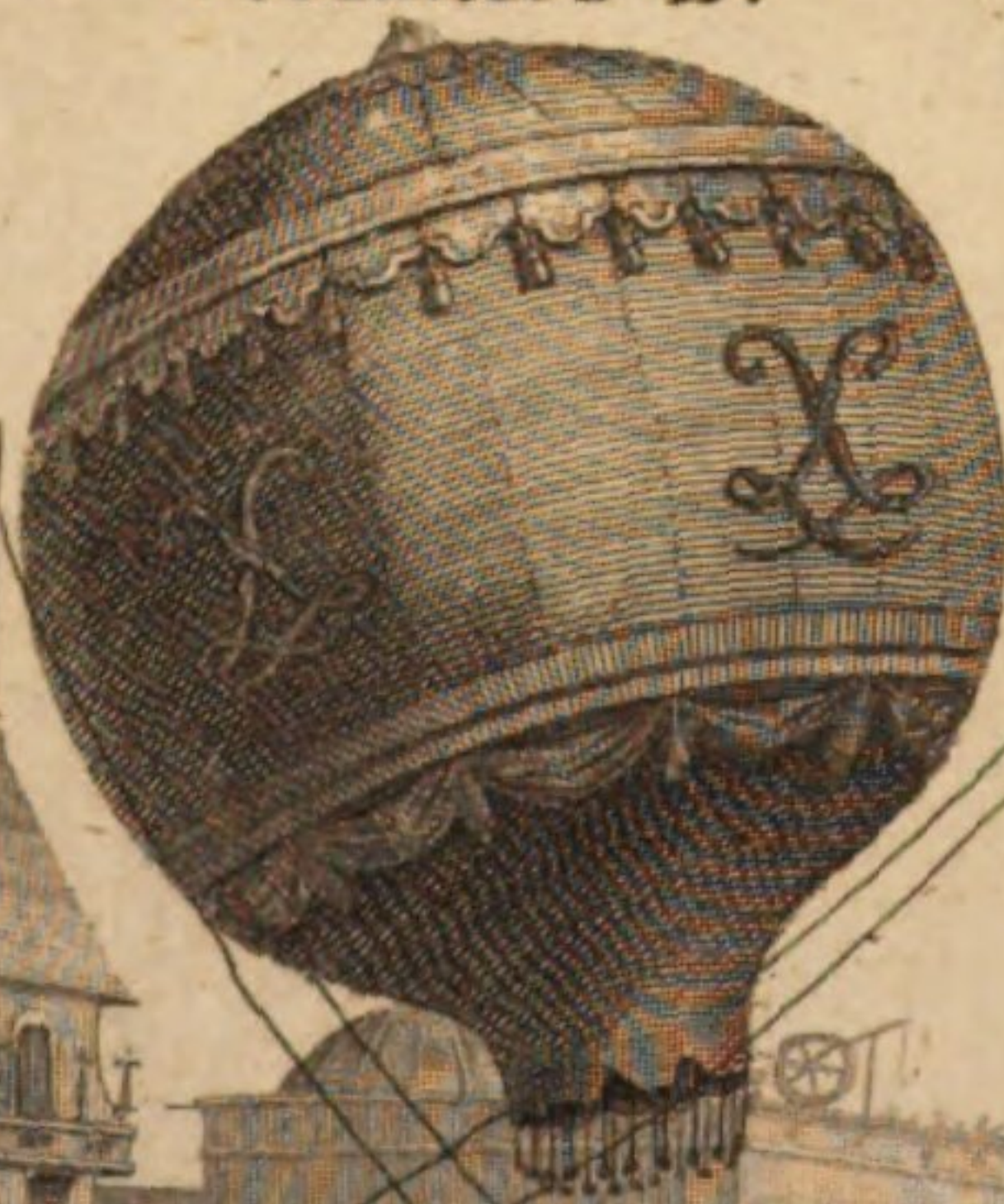
AEROSTATION.



Blanchard's Balloon.



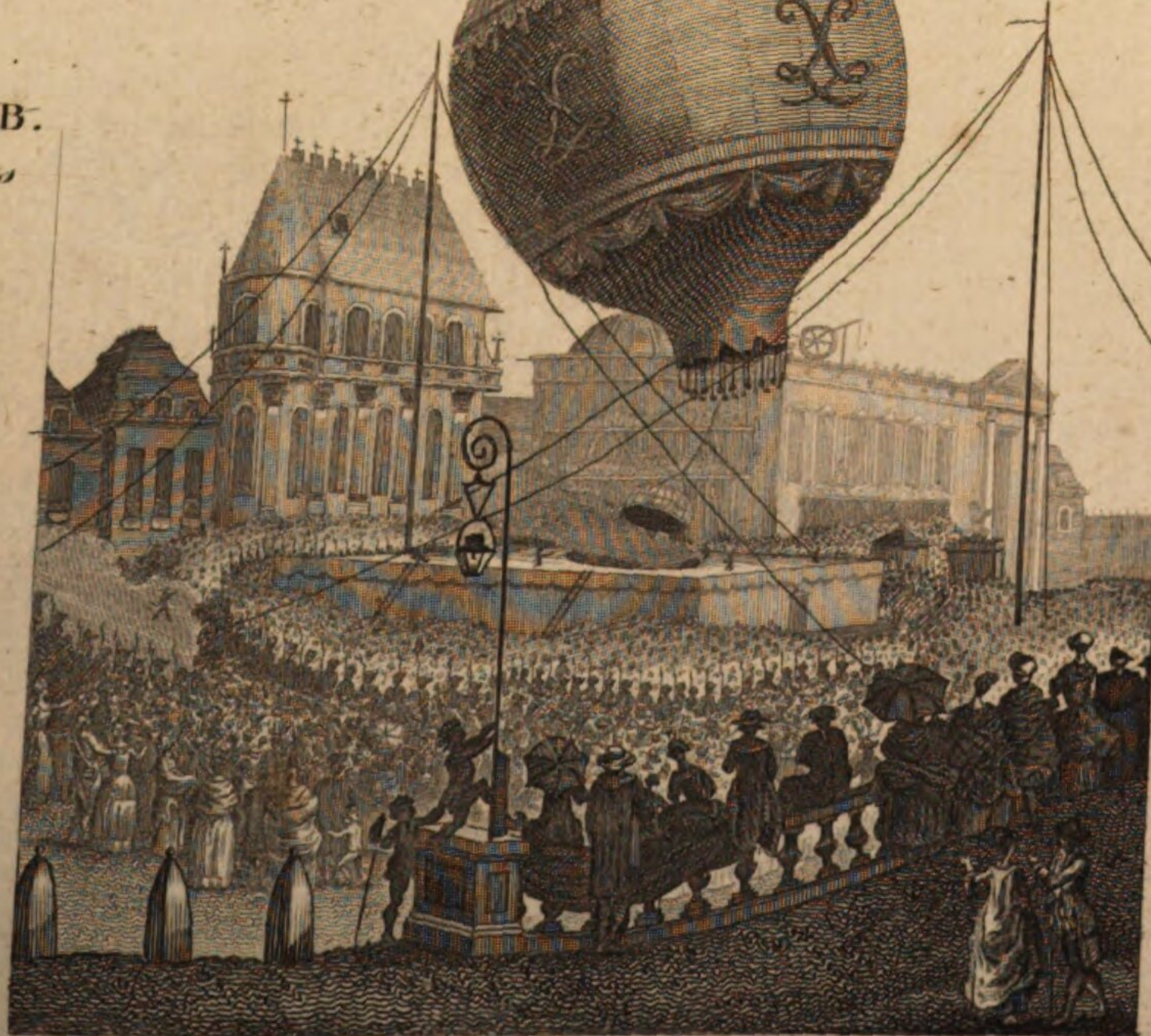
Verfailles B.



Montgolfier's B.
Sauvbourg of St Germain.



Charles & Robert's B.
Champ de Mars



means of the power of ascent with which they left the ground, the balloon rose till the mercury fell to 27 inches, from which they calculated their height to be about 600 yards. By throwing out ballast occasionally as they found the machine descending by the escape of some of the inflammable air, they found it practicable to keep at pretty near the same distance from the earth during the rest of their voyage; the quicksilver fluctuating between 27 and 27.65 inches, and the thermometer between 53° and 57°, the whole time. They continued in the air for the space of an hour and three quarters, when they alighted at the distance of 27 miles from Paris; having suffered no inconvenience during their voyage, nor experienced any contrary currents of air, as had been felt by Messrs Pilatre and Arlandes. As the balloon

¹⁸ Mr Charles still retained a great quantity of inflammable gas, Mr Charles determined to take another voyage by himself. Mr Robert accordingly got out of the boat, which was thus lightened by 130 pounds, and of consequence the aerostatic machine now had nearly as much power of ascent. Thus he was carried up with such velocity, that in twenty minutes he was almost 9000 feet high, and entirely out of sight of terrestrial objects. At the moment of his parting with the ground, the globe had been rather flaccid; but it soon began to swell, and the inflammable air escaped from it in great quantity through the silken tube. He also frequently drew the valve that it might be the more freely emitted, and the balloon effectually prevented from bursting. The inflammable gas being considerably warmer than the external air, diffused itself all round, and was felt like a warm atmosphere; but in ten minutes the thermometer indicated a variation of temperature as great as that between the warmth of spring and the ordinary cold of winter. His fingers were benumbed by the cold, and he felt a violent pain in his right ear and jaw, which he ascribed to the dilatation of the air in these organs as well as to the external cold. The beauty of the prospect which he now enjoyed, however, made amends for these inconveniences. At his departure the sun was set on the valleys; but the height to which Mr Charles was got in the atmosphere, rendered him again visible, tho' only for a short time. He saw, for a few seconds, vapours rising from the valleys and rivers. The clouds seemed to ascend from the earth, and collect one upon the other, still preserving their usual form; only their colour was grey and monotonous for want of sufficient light in the atmosphere. By the light of the moon, he perceived that the machine was turning round with him in the air; and he observed that there were contrary currents which brought him back again. He observed also, with surprise, the effects of the wind, and that the streamers of his banners pointed upwards; which, he says, could not be the effect either of his ascent or descent, as he was moving horizontally at the time. At last, recollecting his promise of returning to his friends in half an hour, he pulled the valve, and accelerated his descent. When within 200 feet of the earth, he threw out two or three pounds of ballast, which rendered the balloon again stationary; but, in a little time afterwards, he gently alighted in a field about three miles distant from the place whence he set out; though, by making allowance for all the turn-

ings and windings of the voyage, he supposes that he had gone through nine miles at least. By the calculations of M. de Maunier, he rose at this time not less than 10,500 feet high; a height somewhat greater than that of Mount *Ætna*. A small balloon, which had been sent off before the two brothers set out on their voyage, took a direction opposite to that of the large one, having met with an opposite current of air, probably at a much greater height.

The subsequent aerial voyages differ so little from that just now related, that any particular description of them seems to be superfluous. It had occurred to Mr Charles, however, in his last flight, that there might be a possibility of directing the machine in the atmosphere; and this was soon attempted by Mr Jean-Pierre Blanchard, a gentleman who had, for several years before, amused himself with endeavours to fly by mechanical means, though he had never succeeded in the undertaking. As soon as the discovery of the aerostatic machines was announced, however, he resolved to add the wings of his former machine to a balloon, and made no doubt that it would then be in his power to direct himself through the air at pleasure. In his first attempt he was frustrated by the impetuosity of a young gentleman, who insisted, right or wrong, on ascending along with him. In the scuffle which ensued on this occasion, the wings and other apparatus were entirely destroyed; so that Mr Blanchard was obliged to commit himself to the direction of the wind; and in another attempt it was found, that all the strength he could apply to the wings was scarce sufficient to counteract the impression of the wind in any degree. In his voyage, he found his balloon, at a certain period, acted upon by two contrary winds; but, on throwing out four pounds of ballast, he ascended to a place where he met with the same current he had at setting out from the earth. His account of the sensations he felt during this voyage, was somewhat different from that of Mr Charles; having, in one part of it, found the atmosphere very warm, in another cold; and having once found himself very hungry, and at another time almost overcome by a propensity to sleep. The height to which he arose, as measured by several observations with mathematical instruments, was thought to be very little less than 10,000 feet; and he remained in the atmosphere an hour and a quarter.

The attempts of Mr Blanchard to direct his machine through the atmosphere, were repeated in the month of April 1784 by Messrs Morveau and Bertrand, at Dijon, who raised themselves with an inflammable air-balloon to the height, as it was thought, of 13,000 feet; passing through a space of 18 miles in an hour and 25 minutes. Mr Morveau had prepared a kind of oars for directing the machine through the air; but they were damaged by a gust of wind, so that only two of them remained serviceable; by working these, however, they were able to produce a sensible effect on the motion of the machine. In a third aerial voyage performed by Mr Blanchard, he seemed to produce some effect by the agitation of his wings, both in ascending, descending, moving sidewise, and even in some measure against the wind; however, this is supposed, with some probability, to have been a mistake, as, in all his succeeding voyages, the effects of his machinery could not be perceived.

¹⁹ Has a pain in his ear and jaw when in the higher regions.

²⁰ Various currents of wind and eddies in these regions.

Streamers of his banners stand upwards.

²² Attempts to guide aerostatic machines in the atmosphere.

²³ Two first voyages of Mr Blanchard.

²⁴ His sensations while in the atmosphere.

²⁵ Voyage of Messrs Morveau and Bertrand.

²⁶ Third voyage of Mr Blanchard.

27
Second
voyage of
Messrs. Char-
les and Ro-
bert.

The success of Messrs Charles and Robert in their former experiments, encouraged them soon to repeat them, with the addition of some machinery to direct their course. Having enlarged their former balloon to the size of an oblong spheroid $46\frac{1}{2}$ feet long and $27\frac{1}{2}$ in diameter, they made it to float with its longest part parallel to the horizon. The wings were made in the shape of an umbrella without the handle, to the top of which a stick was fastened parallel to the aperture of the umbrella. Five of these were disposed round the boat, which was near 17 feet in length. The balloon was filled in three hours, and, with the addition of 450 pounds of ballast, remained in *equilibrium* with the atmosphere. About noon, on the 19th of September 1784, they began to ascend very gently in consequence of throwing out 24 pounds of ballast, but were soon obliged to throw out eight pounds more in order to avoid running against some trees. Thus they rose to the height of 1400 feet, when they perceived some thunder-clouds near the horizon. On this they ascended and descended, to avoid the danger, as the wind blew directly towards the threatening clouds; but, from the height of 600 feet to that of 4200 above the surface of the earth, the current was quite uniform and in one direction. During their voyage they lost one of their oars; but found, that by means of those which remained, they considerably accelerated their course. From the account of their voyage, it would seem that they had passed safely through the thunder-clouds; as we are informed, that, about 40 minutes after three, they heard a loud clap of thunder; and, three minutes after, another much louder; at which time the thermometer sunk from 77 to 59 degrees. This sudden cold, occasioned by the approach of the clouds, condensed the inflammable air so that the balloon descended very low, and they were obliged to throw out 40 pounds of ballast; yet on examining the heat of the air within the balloon, they found it to be 104° , when that of the external atmosphere was only 63. When they had got so high that the mercury in the barometer stood only at 23.94 inches, they found themselves becalmed; so that the machine did not go even at the rate of two feet in a second, though it had before gone at the rate of 24 feet in a second. On this they determined to try the effect of their oars to the utmost; and, by working them for 35 minutes, and marking the shadow of the balloon on the ground, they found, in that time, that they had described the segment of an ellipsis whose longest diameter was 6000 feet. After having travelled about 150 miles, they descended, only on account of the approach of night, having still 200 pounds of ballast left.

29
Heat of the
air within
their bal-
loon.

30
Effect of
their oars
in moving
the ma-
chine.

Their conclusion, with regard to the effect of their wings, is as follows: "Those experiments show, that far from going against the wind, as is said by some persons to be possible in a certain manner, and some aeronauts pretend to have actually done, we only obtained, by means of two oars, a deviation of 22 degrees: it is certain, however, that if we could have used our four oars, we might have deviated about 40 degrees from the direction of the wind, and as our machine would have been capable of carrying seven persons, it would have been easy for five persons to have gone, and to have put in action eight oars, by means of

which a deviation of about 80 degrees would have been obtained.

"We had already observed (say they), that if we did not deviate more than 22 degrees, it was because the wind carried us at the rate of 24 miles an hour; and it is natural to judge, that, if the wind had been twice as strong as it was, we should not have deviated more than one-half of what we actually did; and, on the contrary, if the wind had been only half as strong, our deviation would have been proportionably greater."

Having thus related all that has been done with re-
gard to the conducting of aerostatic machines through
the atmosphere, we shall now relate the attempts that
have been made to lessen their expence, by falling upon
some contrivance to ascend without throwing out bal-
last, and to descend without losing any of the inflam-
mable air. The first attempt of this kind was made
by the Duke de Chartres; who, on the 15th of July
1784, ascended with the two brothers, Charles and Ro-
bert, from the Park of St Cloud. The balloon was
of an oblong form, made to ascend with its longest
diameter horizontally, and measured 55 feet in length
and 24 in breadth. It contained within it a smaller
balloon filled with common air; by blowing into which
with a pair of bellows, and thus throwing in a confi-
derable quantity of common air, it was supposed that
the machine would become sufficiently heavy to de-
scend, especially as, by the inflation of the internal bag,
the inflammable air in the external one would be con-
densed into a smaller space, and thus become specifi-
cally heavier. The voyage, however, was attended with
such circumstances as rendered it impossible to know
what would have been the event of the scheme. The
power of ascent with which they set out, seems to have
been very great; as, in three minutes after parting with
the ground, they were lost in the clouds, and involved
in such a dense vapour that they could see neither the
sky nor the earth. In this situation they seemed to be
attacked by a whirlwind, which, besides turning the
balloon three times round from right to left, shocked,
and beat it so about, that they were rendered incapable
of using any of the means proposed for directing their
course, and the silk stuff of which the helm had been
composed was even torn away. No scene can be con-
ceived more terrible than that in which they were now
involved. An immense ocean of shapeless clouds rolled
one upon another below them, and seemed to prevent
any return to the earth, which still continued invisible,
while the agitation of the balloon became greater every
moment. In this extremity they cut the cords which
held the interior balloon, and of consequence it fell
down upon the aperture of the tube that came from
the large balloon into the boat, and stopped it up.
They were then driven upwards by a gust of wind from
below, which carried them to the top of that stormy
vapour in which they had been involved. They now
saw the sun without a cloud; but the heat of his rays,
with the diminished density of the atmosphere, had such
an effect on the inflammable air, that the balloon seem-
ed every moment ready to burst. To prevent this they
introduced a stick through the tube, in order to push
away the inner balloon from its aperture; but the ex-
pansion of the inflammable air pushed it so close, that
all

31
Contrivances used to prevent the waste of inflammable air.

32
Voyage of the Duke de Chartres

33
Is involved in dark clouds and attacked by a whirlwind.

all attempts of this kind proved ineffectual. It was now, however, become absolutely necessary to give vent to a very considerable quantity of the inflammable air; for which purpose the Duke de Chartres himself bored two holes in the balloon, which tore open for the length of seven or eight feet. On this they descended with great rapidity; and would have fallen into a lake, had they not hastily thrown out 60 pounds of ballast, which enabled them just to reach the water's edge.

34
Unfortunate voyage and death of Mess R. and Romaine.

The success of the scheme for raising or lowering aerostatic machines by means of bags filled with common air being thus rendered dubious, another method was thought of. This was to put a small aerostatic machine with rarefied air under an inflammable air-balloon, but at such a distance that the inflammable air of the latter might be perfectly out of the reach of the fire used for inflating the former; and thus, by increasing or diminishing the fire in the small machine, the absolute weight of the whole would be considerably diminished or augmented. This scheme was unhappily put in execution by the celebrated Mr Pilatre de Rozier, and another gentleman named Mr Romaine. Their inflammable-air balloon was about 37 feet in diameter, and the power of the rarefied-air one was equivalent to about 60 pounds. They ascended without any appearance of danger or sinister accident; but had not been long in the atmosphere when the inflammable-air balloon was seen to swell very considerably, at the same time that the aeronauts were observed, by means of telescopes, very anxious to get down, and busied in pulling the valve and opening the appendages to the balloon, in order to facilitate the escape of as much inflammable air as possible. A short time after this the whole machine was on fire, when they had then attained the height of about three quarters of a mile from the ground. No explosion was heard; and the silk which composed the air balloon continued expanded, and seemed to resist the atmosphere for about a minute; after which it collapsed, and the remains of the apparatus descended along with the two unfortunate travellers so rapidly, that both of them were killed. Mr Pilatre seemed to have been dead before he came to the ground; but Mr Romaine was alive when some persons came up to the place where he lay, though he expired immediately after.

35
Voyage of Mess Blanchard and Jeffries across the Straits of Dover.

These are the most remarkable attempts that have been made to improve the science of aerostation; though a great number of other expeditions through the atmosphere have taken place. But of all the voyages which had been hitherto projected or put in execution, the most daring was that of Mr Blanchard and Dr Jeffries across the Straits of Dover, which separate Britain from France. This took place on the 7th of January 1785, being a clear frosty morning, with a wind, barely perceptible, at N. N. W. The operation of filling the balloon began at 10 o'clock, and, at three quarters after twelve, every thing was ready for their departure. At one o'clock Mr Blanchard desired the boat to be pushed off, which now stood only two feet distant from that precipice so finely described by Shakespeare in his tragedy of King Lear. As the balloon

was scarcely sufficient to carry two, they were obliged to throw out all their ballast except three bags of 10 pounds each; when they at last rose gently, though making very little way on account of there being so little wind. At a quarter after one o'clock, the barometer, which on the cliff stood at 29.7 inches, was now fallen to 27.3, and the weather proved fine and warm. They had now a most beautiful prospect of the south coast of England, and were able to count 37 villages upon it. After passing over several vessels, they found that the balloon, at 50 minutes after one, was descending, on which they threw out a sack and an half of ballast; but as they saw that it still descended, and that with much greater velocity than before, they now threw out all the ballast. This still proving ineffectual, they next threw out a parcel of books they carried along with them, which made the balloon ascend, when they were about midway betwixt France and England. At a quarter past two, finding themselves again descending, they threw away the remainder of their books, and, ten minutes after, they had a most enchanting prospect of the French coast. Still, however, the machine descended; and as they had now no more ballast, they were fain to throw away their provisions for eating, the wings of their boat, and every other moveable they could easily spare. "We threw away, says Dr Jeffries, our only bottle, which, in its descent, cast out a steam like smoke, with a rushing noise; and when it struck the water, we heard and felt the shock very perceptibly on our car and balloon." All this proving insufficient to stop the descent of the balloon, they next threw out their anchors and cords, and at last stripped off their clothes, fastening themselves to certain flings, and intending to cut away the boat as their last resource. They had now the satisfaction, however, to find that they were rising; and as they passed over the high lands between Cape Blanc and Calais, the machine rose very fast, and carried them to a greater height than they had been at any former part of their voyage. They descended safely among some trees in the forest of Guennes, where there was just opening enough to admit them.

It would be tedious as well as unnecessary to recount all the other aerial voyages that have been performed in our own or other countries: It appeared sufficient for the purpose of this article to notice those which were most remarkable and interesting; and therefore an account of the ingenious Mr Baldwin's excursion from Chester, alluded to above, shall now close our enumeration.

On the 8th of September 1785, at forty minutes past one P. M. Mr Baldwin ascended from Chester in Mr Lunardi's (A) balloon. After traversing in a variety of different directions, he first alighted, at 28 minutes after three, about twelve miles from Chester, in the neighbourhood of Fródsham; then reascending and pursuing his excursion, he finally landed at Rixton moss, five miles N. N. E. of Wavington, and 25 miles from Chester. Mr Baldwin has published his Observations and Remarks made during his voyage, and taken from minutes. Our limits will not admit of relating many

C c 2

(A) Of this gentleman's adventurous excursions most people have been witnesses; and therefore it appeared unnecessary to take up room with an account of them in this article.

many of his observations; but the few following are some of the most important and curious. "The sensation of ascending is compared to that of a strong pressure from the bottom of the car upwards against the soles of his feet. At the distance of what appeared to him seven miles from the earth, though by the barometer scarcely a mile and a half, he had a grand and most enchanting view of the city of Chester and its adjacent places below. The river Dee appeared of a red colour; the city very diminutive; and the town entirely blue. The whole appeared a perfect plain, the highest building having no apparent height, but reduced all to the same level, and the whole terrestrial prospect appeared like a coloured map. Just after his first ascent, being in a well-watered and maritime part of the country, he observed a remarkable and regular tendency of the balloon towards the sea; but shortly after rising into another current of air, he escaped the danger: this upper current, he says, was visible to him at the time of his ascent, by a lofty sound stratum of clouds flying in a safe direction. The perspective appearance of things to him was very remarkable. The lowest bed of vapour that first appeared as cloud was pure white, in detached fleeces, increasing as they rose: they presently coalesced, and formed, as he expresses it, a sea of cotton, tufting here and there by the action of the air in the undisturbed part of the clouds. The whole became an extended white floor of cloud, the upper surface being smooth and even. Above this white floor he observed, at great and unequal distances, a vast assemblage of thunder-clouds, each parcel consisting of whole acres in the densest form: he compares their form and appearance to the smoke of pieces of ordnance, which had consolidated as it were into masses of snow, and penetrated through the upper surface or white floor of common clouds, there remaining visible and at rest. Some clouds had motions in flow and various directions, forming an appearance truly stupendous and majestic. He endeavours to convey some idea of the scene by a figure; (and from which fig. 13. of 2d Plate II. is copied). *A* represents a circular view he had from the car of the balloon, himself being over the centre of the view, looking down on the white floor of clouds and seeing the city of Chester through an opening, which discovered the landscape below, limited by surrounding vapour, to less than two miles in diameter. The breadth of the outer margin defines his apparent height in the balloon (*viz.* 4 miles) above the white floor of clouds. Mr Baldwin also gives a curious description of his tracing the shadow of the balloon over tops of volumes of clouds. At first it was small, in size and shape like an egg; but soon increased to the magnitude of the sun's disc, still growing larger, and attended with a most captivating appearance of an iris encircling the whole shadow at some distance round it, the colours of which were remarkably brilliant. The regions did not feel colder, but rather warmer, than below. The sun was hottest to him when the balloon was stationary. The discharge of a cannon when the balloon was at a considerable height, was distinctly heard by the aeronaut; and a discharge from the same piece, when at the height of 30 yards, so disturbed him as to oblige him for safety to lay hold firmly of the cords of the balloon. At a considerable

height he poured down a pint-bottle full of water; and as the air did not oppose a resistance sufficient to break the steam into small drops, it mostly fell down in large drops. In the course of the balloon's tract it was found much affected by the water (a circumstance observed in former aerial voyages). At one time the direction of the balloon kept continually over the water, going directly towards the sea, so much as to endanger the aeronaut; the mouth of the balloon was opened, and he in two minutes descended into an under current blowing from the sea: he kept descending, and landed at Bellair farm in Rinsley, 12 miles from Chester. Here he lightened his car by 31 pounds, and instantly reascending, was carried into the anterior part of the country, performing a number of different manœuvres. At his greatest altitude he found his respiration free and easy. Several bladders which he had along with him crackled and expanded very considerably. Clouds and land, as before, appeared on the same level. By way of experiment, he tried the upper valve two or three times, the neck of the balloon being close; and remarked, that the escape of the gas was attended with a growling noise like millstones, but not near so loud. Again, round the shadow of the balloon, on the clouds he observed the iris. A variety of other circumstances and appearances he met with, is fancifully described; and at 53 minutes past three he finally landed.

The frequency of aerial voyages, accompanied with particular details of trifling and uninteresting circumstances, and apparently made with a view to promote the interest of particular persons, regardless of any advancement in knowledge, have now sunk the science of aerostation so low in the opinion of most people, that before giving any account of the most proper method of constructing these machines, it may seem necessary to premise something concerning the uses to which they may possibly be applied. These, according to Mr Cavallo, are the following.

"The small balloons, especially those made of paper, and raised by means of spirit of wine, may serve to explore the direction of the winds in the upper regions of the atmosphere, particularly when there is a calm below: they may serve for signals in various circumstances, in which no other means can be used; and letters or other small things may be easily sent by them, as for instance from ships that cannot safely land on account of storms, from besieged places, islands, or the like. The larger aerostatic machines may answer all the abovementioned purposes in a better manner; and they may, besides, be used as a help to a person who wants to ascend a mountain, a precipice, or to cross a river; and perhaps one of those machines tied to a boat by a long rope, may be, in some cases, a better sort of sail than any that is used at present. The largest sort of machines, which can take up one or more men, may evidently be subservient to various economical and philosophical purposes. Their conveying people from place to place with great swiftness, and without trouble, may be of essential use, even if the art of guiding them in a direction different from that of the wind should never be discovered. By means of those machines the shape of certain seas and lands may be better ascertained; men may ascend to the tops of mountains they never visited before; they may be carried over marshy and

and dangerous grounds; they may by that means come out of a besieged place, or an island; and they may, in hot climates, ascend to a cold region of the atmosphere, either to refresh themselves, or to observe the ice, which is never seen below; and, in short, they may be thus taken to several places, to which human art hitherto knew of no conveyance.

"The philosophical uses, to which these machines may be subservient, are numerous indeed; and it may be sufficient to say, that hardly any thing which passes in the atmosphere is known with precision, and that principally for want of a method of ascending into it. The formation of rain, of thunder-storms, of vapours, hail, snow, and meteors in general, require to be attentively examined and ascertained. The action of the barometer, the refraction and temperature of the air in various regions, the descent of bodies, the propagation of sound, &c. are subjects which all require a series of observations and experiments, the performance of which could never have been properly expected before the discovery of aerostatic machines."

To those uses we may add the gratification of curiosity and pleasure as a very strong inducement to the practice of an art, in which, with any tolerable degree of caution, there appears not to be the smallest danger. Every one who has tried the experiment testifies, that the beauty of the prospect afforded by an ascent, or the pleasure of being conveyed through the atmosphere, cannot be exceeded. No one has felt the least of that giddiness consequent upon looking from the top of a very high building or of a precipice, nor have they any of the sickness arising from the motion of a vessel at sea. Many have been carried by balloons at the rate of 30, 40, or even 50 miles an hour, without feeling the least inconvenience, or even agitation of the wind; the reason of which is, that as the machine moves with nearly the velocity of the wind itself, they are always in a calm, and without uneasiness. Some have apprehended danger from the electricity of the atmosphere; and have thought that a stroke of lightening, or the smallest electric spark, happening near a balloon, might set fire to the inflammable air, and destroy both the machine and the adventurers. Mr Cavallo has suggested several considerations for diminishing apprehensions of this kind. Balloons have been already raised in every season of the year, and even when thunder has been heard, without injury. In case of danger, the aeronauts may either descend to the earth, or ascend above the region of the clouds and thunder-storms. Besides, as balloons are formed of materials that are not conductors of electricity, they are not likely to receive strokes, especially as by being encompassed with air they stand insulated. Moreover, inflammable air by itself, or unmixed with a certain quantity of common air, will not burn; so that if an electric spark should happen to pass through the balloon, it would not set fire to the inflammable air, unless a hole was made in the covering.

37
Principles
of aerosta-
tion.

The general principles of aerostation are so little different from those of hydrostatics, that it may seem superfluous to insist much upon them. It is a fact universally known, that when a body is immersed in any fluid, if its weight be less than an equal bulk of that fluid, it will rise to the surface; but if heavier, it will sink; and if equal, it will remain in the place where it

is left. For this reason smoke ascends into the atmosphere, and heated air in that which is colder. The ascent of the latter is shown in a very easy and satisfactory manner by bringing a red-hot iron under one of the scales of a balance, by which the latter is instantly made to ascend; for, as soon as the red-hot iron is brought under the scale, the hot air being lighter than that which is colder, ascends, and strikes the bottom, which is thus impelled upwards, and the opposite scale descends, as if a weight had been put into it.

Upon this simple principle depends the whole theory of aerostation; for it is the same thing whether we render the air lighter by introducing a quantity of heat into it, or inclosing a quantity of gas specifically lighter than the common atmosphere in a certain space; both will ascend, and for the same reason. A cubic foot of air, by the most accurate experiments, has been found to weigh about 554 grains, and to be expanded by every degree of heat, marked on Fahrenheit's thermometer, about $\frac{1}{380}$ th part of the whole. By heating a quantity of air, therefore, to 500 degrees of Fahrenheit, we will just double its bulk when the thermometer stands at 54 in the open air, and in the same proportion we will diminish its weight; and if such a quantity of this hot air be inclosed in a bag, that the excess of the weight of an equal bulk of common air weighs more than the bag with the air contained in it, both the bag and air will rise into the atmosphere, and continue to do so until they arrive at a place where the external air is naturally so much rarefied that the weight becomes equal; and here the whole will float.

The power of hot air in raising weights, or rather that by which it is itself impelled upwards, may be shown in the following manner: Roll up a sheet of paper into a conical form, and, by thrusting a pin into it near the apex, prevent it from unrolling. Fasten it then, by its apex, under one of the scales of a balance by means of a thread, and, having properly counterpoised it by weights, put it into the opposite scale; apply the flame of a candle underneath, you will instantly perceive the cone to arise, and it will not be brought into equilibrium with the other but by a much greater weight than those who have never seen the experiment would believe. If we try this experiment with more accuracy, by getting proper receptacles made which contain determinate quantities of air, we will find that the power of the heat depends much more on the capacity of the bag which contains it than could well be supposed. Thus, let a cubical receptacle be made of a small wooden frame covered with paper capable of containing one foot of air, and let the power of a candle be tried with this as above directed for the paper cone. It will then be found that a certain weight may be raised; but a much greater one will be raised by having a receptacle of the same kind which contains two cubic feet; a still greater by one of three feet; a yet greater by one of four feet, &c. and this even though the very same candle be made use of; nor is it known to what extent even the power of this small flame might be carried.

From these experiments it appears, that in the aerostatic machines constructed on Montgolfier's plan, it must be an advantage to have them as large as possible; because possible.

39
Rarefied
air balloons
ought to be
made as
large as
possible.

40
How balloons might rise by the common heat of the atmosphere

because a smaller quantity of fire will then have a greater effect in raising them, and the danger from that element, which in this kind of machines is chiefly to be dreaded, will be in a great measure avoided. On this subject it may be remarked, that as the cubical contents of a globe, or any other figure of which balloons are made, increase much more rapidly than their surfaces, there must ultimately be a degree of magnitude at which the smallest imaginable heat would raise any weight whatever. Thus, supposing any aerostatic machine capable of containing 500 cubic feet, and the air within it to be only one degree hotter than the external atmosphere; the tendency of this machine to rise, even without the application of artificial heat, would be near an ounce. Let its capacity be increased 16 times; and the tendency to arise will be equivalent to a pound, though this may be done without making the machine 16 times heavier than before. It is certain, however, that all aerostatic machines have a tendency to produce or preserve heat within them, which would by no means be imagined by those who have not made the experiment. When Messrs Charles and Roberts made their longest aerial voyage of 150 miles, they had the curiosity to try the temperature of the air within their balloon, in comparison with that of the external atmosphere; and at this time they found, that, when the external atmosphere was 63°, the thermometer within the balloon stood at 104°. Such a difference of temperature must have given a machine of the magnitude which carried them a considerable ascending power independent of any other cause, as it amounted to 41 grains on every cubic foot; and therefore in a machine containing 50,000 such feet would have been almost 200 pounds. Hence we may easily account for what happened at Dijon, and is recorded by Mr Morveau. "A balloon, intended to be filled with inflammable air, being completed, was, by way of trial, filled with common air, and in that state exposed to the atmosphere. Now it was observed, and indeed a similar observation had been made before, that the air within the balloon was much hotter than the circumambient air: the thermometer in the former stood at 120°; whereas in the latter, even when the sun shone upon it, the thermometer stood at 84°. This showed a considerable degree of rarefaction within the balloon; and consequently it was suspected, that, by means of this rarefaction alone, especially if it were to increase a little, the balloon might ascend. On the 30th of May, about noon, the wind being rather strong, agitated the balloon so that two men were employed to take care of it; but, notwithstanding all their endeavours, it escaped from its confinement; and, lifting up about 65 pounds weight of cords, equatorial circle, &c. rose many feet high, and, passing over some houses, went to the distance of 250 yards, where at length it was properly secured."

41
A balloon at Dijon rises thus into the atmosphere

42
Internal heat of the balloons has great influence on aerial voyages.

This difference between the external and internal heat being so very considerable, must have a great influence upon aerostatic machines, and will undoubtedly influence those filled with inflammable air as well as the other kind. Nor is it unlikely, that the short time which many aerial voyagers have been able to continue in the atmosphere, may have been owing to the want of a method of preserving this internal heat. It may naturally be supposed, and indeed it has always been

found, that balloons, in passing through the higher regions of the atmosphere, acquire a very considerable quantity of moisture, not only from the rain or snow they sometimes meet with, but even from the dew and vapour which condenses upon them. On this an evaporation will instantly take place; and, as it is the property of this operation to produce a very violent cold, the internal heat of the balloon must be soon exhausted in such a manner as to make it become specifically heavier than the common atmosphere, and consequently descend in a much shorter time than it would have done by the mere loss of air. To this, in all probability, we are to ascribe the descent of the balloon which carried Messrs Blanchard and Jeffries; and which seemed so extraordinary to many people, that they were obliged to have recourse to an imaginary attraction in the waters of the ocean, in order to solve the phenomenon. This supposition is rejected by Mr Cavallo; who explains the matter, by remarking, that in two former voyages made with the same machine, it could not long support two men in the atmosphere; so that we had no occasion to wonder at its weakness on this occasion. "As for its rising higher (says he), just when it got over the land, that may be easily accounted for. In the first place, the two travellers threw out their clothes just about that time; secondly, in consequence of the wind's then increasing, the balloon travelled at a much greater rate than it had done whilst over the sea; which increase of velocity lessened its tendency to descend: besides which, the vicissitudes of heat and cold may produce a very considerable effect; for if we suppose, that the air over the land was colder than that over the sea, the balloon coming into the latter from the former, continued to be hotter than the circumambient air for some time after; and consequently, it was comparatively much lighter when in the cold air over the land, than when in the hotter air over the sea; hence it floated easier in the former than in the latter case."

43
Great tendency of Mr Blanchard's balloon to descend accounted for

It seems indeed very probable, that there was something uncommon in the case of Mr Blanchard's balloon while passing over the sea; for, as it rose higher after reaching the land than in any former period of the voyage, and likewise carried them to the distance over land more than half of that which they had passed over water, we can scarce avoid supposing, that it had a tendency to descend when over the water more than when over land, independent of any loss of air. Now, it does not appear that the air over the sea is at all warmer than that above land; on the contrary, there is every reason to believe, that the superior reflective power of the land renders the atmosphere above it warmer than the sea can do: but it is very natural to suppose, that the air above the sea is more moist than that above land; and consequently, by letting fall its moisture upon the balloon, must have occasioned an evaporation that would deprive the machine of its internal heat, which it would partly recover after it entered the warmer and drier atmosphere over land.

We shall now proceed to the construction of aerostatic machines; of which the smaller are only for amusement, or some flight experiments, and are very easily made. As in all of them, however, it is of the utmost consequence to have the weight as little as possible, the shape becomes an object of great consideration.

44
Construction of aerostatic machines.

45
Of their
shape.

tion. For this purpose a spherical figure has been mathematically demonstrated to be the best; as capable of containing a greater quantity under a smaller surface than any other. Thus a perfect sphere contains less surface in proportion to its solidity than a spheroid; a spheroid less than a cylinder; the latter less than a cube; and a cube still less than a parallelopiped. In all cases, therefore, where we can fill the whole capacity of the balloon with air equally light, the spherical figure is undoubtedly to be preferred; and this holds good with regard to all inflammable air-balloons, whether their size be great or small; but in the rarefied air ones, where the under part must necessarily be much colder than the upper, the globular shape seems not so proper. An inverted cone, or truncated pyramid, with the smaller part undermost, seems then to be most proper, as it allows the heated air (which has a great tendency to expand as well as to ascend) to collect in the wide part at the top, while the useless surface in the lower part, and which, in any other figure, would contain only the colder and heavier air, is thus thrown aside. In fact it has been found, that aerostatic machines, raised by means of rarefied air, when made of the shape of a parallelopiped, or even one deviating still more from the shape of a globe, have answered the purpose as well as they could have been supposed to do, had ever so much care been taken in forming them exactly to that shape. The very first machine made by Mr Montgolfier was in form of a parallelopiped; and though it contained only 40 cubic feet, showed a very considerable power of ascent. A very large one, 74 feet high, which Mr Montgolfier had designed to exhibit before the royal family, had the middle part of it prismatic for about the height of 25 feet; its top was a pyramid of 29 feet; and its lower part was a truncated cone of near 20 feet. It weighed 1000 pounds; and, notwithstanding its shape, in a very short time manifested a power of ascent equal to 500 pounds. Another aerostatic machine of a small size, but of the figure of a parallelopiped, being suffered to ascend with 30 sheets of oiled paper fixed in a wire frame, and set on fire, rose to a great height, and in 22 minutes could not be seen. It seems therefore, that, with regard to the shape of these machines, it is by no means necessary to adhere rigidly to that of a sphere; but that any oblong form answers very well.

46
Materials.

For experimental purposes, both the inflammable and rarefied air-balloons may be made of paper; the former being made of that kind called *thin-past*, varnished over with linseed-oil; the latter either of that or any other kind, without varnish. In order to avoid the danger of burning, however, it has been proposed to impregnate the paper of which these small rarefied air-balloons are made with solution of sal-ammoniac, alum, or some other salt; but this does not seem to be necessary. Those filled with inflammable air have been made of gold-beater skin or peeled bladders; but the cheaper material of paper is undoubtedly preferable.

47
Best var-
nish for in-
flammable
air bal-
loons, ac-
cording to
Mr de St
Fond.

For aerostatic machines of a larger size, the material universally employed is varnished silk; and for those of the rarefied-air kind, linen painted over with some size colour, or lined with paper. The best varnish for an inflammable air-balloon is that made with bird lime, and recommended by Mr Faujas de Saint-Fond, in a treatise published on the subject. The following is his

method of preparing it: "Take one pound of birdlime, put it into a new proper earthen pot that can resist the fire, and let it boil gently for about one hour, viz. till it ceases to crackle; or, which is the same thing, till it is so far boiled, as that a drop of it being let fall upon the fire will burn: then pour upon it a pound of spirits of turpentine, stirring it at the same time with a wooden spatula, and keeping the pot at a good distance from the flame, lest the vapour of this essential oil should take fire. After this, let it boil for about six minutes longer; then pour upon the whole three pounds of boiling oil of nuts, linseed, or poppy, rendered drying by means of litharge; stir it well, let it boil for a quarter of an hour longer, and the varnish is made. After it has rested for 24 hours, and the sediment has gone to the bottom, decant it into another pot; and when you want to use it, warm, and apply it with a flat brush upon the silk stuff, whilst that is kept well stretched. One coat of it may be sufficient; but if two are necessary, it will be proper to give one on each side of the silk, and to let them dry in the open air while the silk remains extended."

Mr Cavallo gives the following method of preparing this varnish, which he prefers to that of M. de St Fond — "In order to render linseed-oil drying, boil it with two ounces of saccharum saturni and three ounces of litharge, for every pint of oil, till the oil has dissolved them, which will be accomplished in half an hour; then put a pound of birdlime and half a pint of the drying oil into a pot (iron or copper pots are the safest for this purpose), the capacity of which may be equal to about one gallon, and let it boil very gently over a slow charcoal fire till the birdlime ceases to crackle, which will be in about half or three quarters of an hour; then pour upon it two pints and a half more of drying oil, and let it boil for one hour longer, stirring it very frequently with an iron or wooden spatula. As the varnish, whilst boiling, and especially when it is nearly done, swells very much, care should be had to remove, in those cases, the pot from the fire, and to replace it when the varnish subsides, otherwise it will boil over. Whilst the stuff is boiling, the operator should, from time to time, examine whether the varnish has boiled enough; which is thus known:—Take some of it upon the blade of a knife, and then, after rubbing the blade of another knife upon it, separate the knives; and when, on this separation, the varnish begins to form threads between the two, you may conclude that it is done; and, without losing time, it must be removed from the fire. When it is almost, though not quite, cold, add about an equal quantity of spirit of turpentine: mix it well together, and let it rest till the next day; when, having warmed it a little, strain and bottle it. If it is too thick, add some more spirit of turpentine. When this varnish is laid upon the silk, the stuff should be made perfectly dry, and stretched; so that the varnish, which ought to be used lukewarm, may fill up the pores of the stuff. The varnish should be laid once very thin upon one side of the stuff; and, about 12 hours after, two other coats of it should be laid on, one on each side; and, 24 hours after, the silk may be used, though, in cold weather, it may be left to dry some time longer."

Much has been said in France of their elastic gum-varnish,

48
Mr Cavallo's
method.

varnish, and its composition kept a secret; but Mr Baldwin, after many expensive trials, declares to the world what he considers as the secret; and it is merely this: "Take any quantity of caoutchouc, as two ounces averdupois; cut it into small bits with a pair of scissars; put a strong iron ladle (like that used by plumbers) over a common pitcoal or other fire. The fire must be gentle, glowing, and without smoke. When the ladle is hot, much below a red heat, put a single bit into the ladle. If *black* smoke issues, it will presently flame and disappear, or it will evaporate without flame: the ladle is then too hot. When the ladle is less hot, put in a second bit, which will produce a *white* smoke. This *white* smoke will continue during the operation, and evaporate the caoutchouc: therefore no time is to be lost; but little bits are to be put in, a few at a time, till the whole are melted. It should be continually and gently stirred with an iron or brass spoon. Two pounds or one quart of the best drying oil (or of raw linseed-oil, which, together with a few drops of neats-foot oil, has stood a month, or not so long, on a lump of quicklime, to make it more or less drying), is to be put into the melted caoutchouc, and stirred till hot, and the whole poured into a glazed vessel, through a coarse gauze or fine sieve. When settled and clear, which will be in a few minutes, it will be fit for use either hot or cold." Mr Baldwin is not at liberty, he observes, to publish the art of laying on the varnish: but says, that it consists in making no *intestine motion* in the varnish, which would create minute bubbles; that therefore brushes are improper. Mr Blanchard's method of making elastic gum varnish for the silk of a balloon, is the following. "Dissolve elastic gum (caoutchouc) cut small in five times its weight of spirit of turpentine, by keeping them some days together; then boil one ounce of this solution in eight ounces of drying linseed-oil for a few minutes; lastly, strain it. It must be used warm." The pieces of silk for the balloon must be cut out of a proper size, according to the dimensions, after the varnish is sufficiently dry. They may be joined by laying about half an inch of the edge of one piece over the edge of the other, and sewing them by a double stitching. Mr Blanchard uses expeditiously the following method. He lays about half an inch of the edge of one piece flat over the edge of the other, and passes a hot iron over it; in doing which a piece of paper ought to be laid both under and over the silk. The joining may be rendered more secure by running it with a silk thread, and sticking a ribband over it. The ribbands laid over seams may be stuck with common glue, provided the varnish of the silk is properly dried. When the glue is quite dry, the ribbands should be varnished over, to prevent their being unglued by the rain.

49
Of cutting
the gores
for a globe

2d Plate II.
fig. 5.

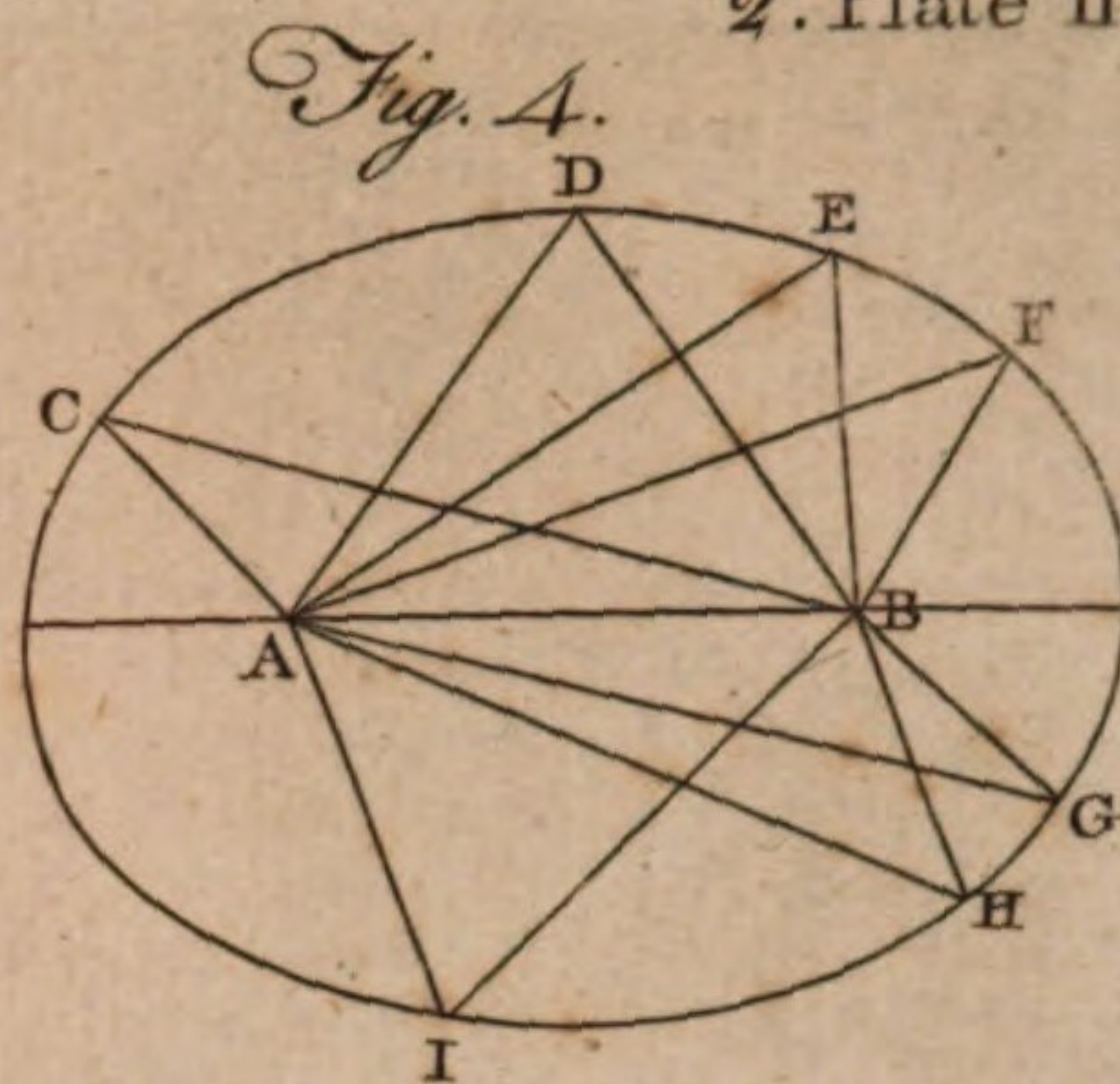
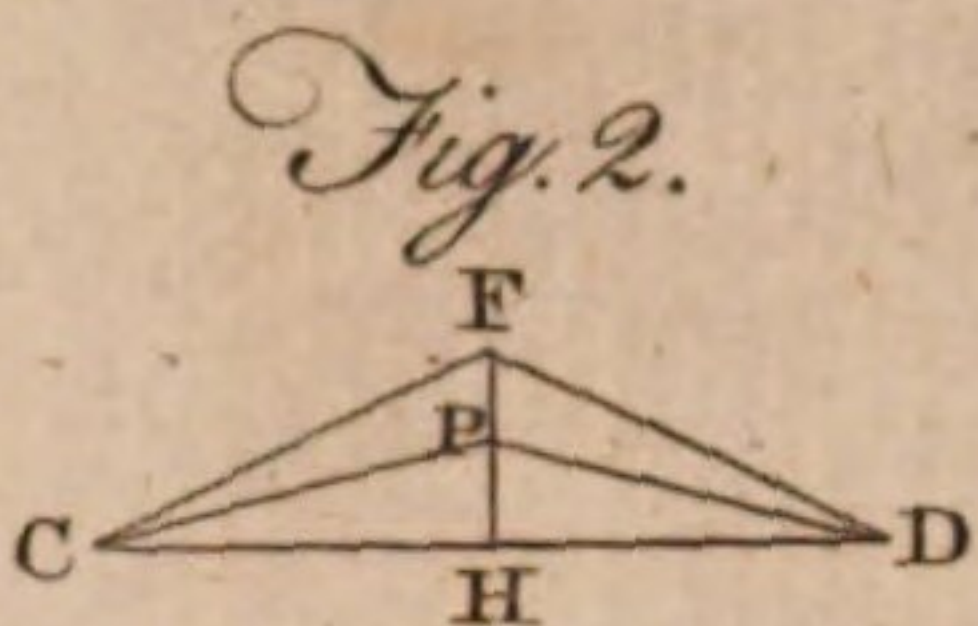
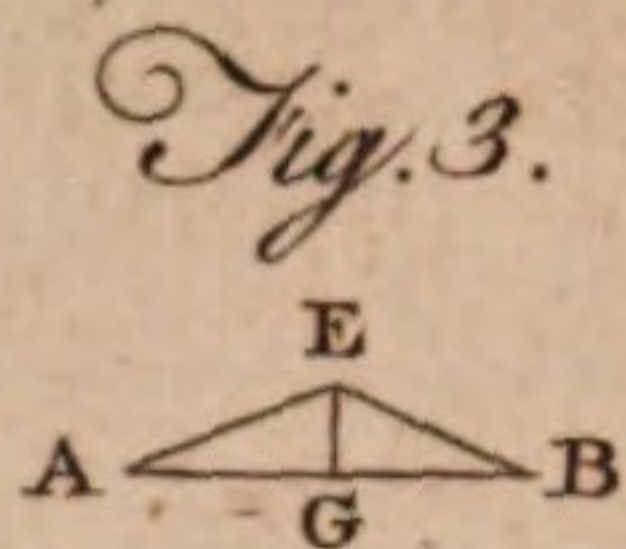
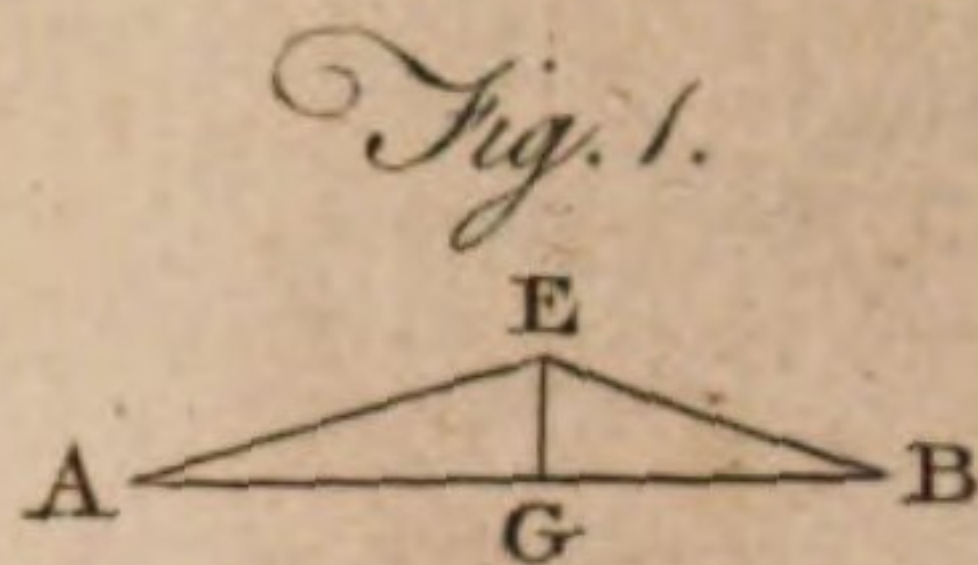
The best method of cutting the pieces of silk that are to form a balloon, is to describe a pattern of wood or stiff card-paper, and then to cut the silk upon it. As the edges of such a pattern are not perfect circles, they cannot be described by a pair of compasses: but the best method of drawing them is as follows. First, draw on a flat surface two right lines *AE* and *BC*, perpendicular to each other. Secondly, find the circumference answering to the given diameter of the balloon in feet and decimals of a foot; and make *AD* and *DE* N° 6.

each equal to a quarter of the circumference, so that the whole length *AE* of the pattern may be equal to half the circumference. Thirdly, divide *AD* into 18 equal parts; and to the points of division apply the lines *fg*, *hi*, *kl*, &c. parallel to each other, and perpendicular to *AD*. Fourthly, divide the whole circumference in twice the given number of pieces, and make *DC* and *BB* each equal to the quotient of this division; so that the whole, *BC*, is equal to the greatest breadth of one of these pieces. Fifthly, multiply the above-mentioned quotient by the decimals annexed to *fg*, viz. 0.99619, and then the product expresses the length of *fg*; again multiply the same length of *DE* by the decimals annexed to *hi*, and the product expresses the length of *hi*; and, in short, the product arising from the multiplication of the length of *DC* by the decimals annexed to each of the parallel lines, gives the length of that line. Lastly, having found the lengths of all these lines, draw by hand a curve-line passing through all the extremities of the said lines, and that is the edge of one quarter of the pattern. The other quarters may be easily described, by applying to them a piece of paper cut according to that already found. Suppose, for example, that the diameter of the balloon to be constructed is 20 feet, and that it is required to make it of 12 pieces: then, in order to draw the pattern for those pieces, find the circumference of the balloon, which is 62.83 feet, and, dividing it by four, the quotient is 15.7 feet; make therefore *AD* equal to 15.7 feet, and *DE* likewise of the same length. Divide the circumference 62.83 by 24, which is double the number of pieces that are to form the balloon, and the quotient, 2.618 feet, is the length of *DC* and likewise of *BD*; so that *BC* is equal to 5.236 feet. Then, having divided the line *AD* into 18 equal parts, and having drawn the parallel lines from those points of division, find the length of each of those lines by multiplying 2.618 by the decimals annexed to that line. Thus, 2.618, multiplied by 0.99619, gives 2.608 feet for the length of *fg*; and again, multiplying 2.618 by 0.98481, gives 2.578 feet for the length of *hi*; and so of the rest.—In cutting the pieces after such a pattern, care should be taken to leave them about three quarters of an inch all round larger than the pattern, which will be taken up by the seams.

To the upper part of the balloon there should be adapted, and well fitted in, a valve opening inwards; to which should be fastened a string passing through a hole made in a small piece of round wood fixed in the lowest part of the balloon opposite to the valve, the end of this string fastened in the car below, so that the aeronaut may open the valve when occasion requires. The action of this valve may be understood from fig. 6. A round brass plate *AB* has a round hole *CD*, about two or three inches diameter, covered on both sides with strong smooth leather. On the inside there is a shutter *E*, also of brass, covered with leather, which is to close the hole *CD*; being about two inches larger in diameter than the hole. It is fastened to the leather of the plate *AB*; and by a spring, which need not be very strong, it is kept against the hole. The elasticity of the gas itself will help to keep it shut. To this shutter the string is fastened, by which it is occasionally opened for the escape of gas. A small string

ACOUSTICS.

2^d. Plate II.



AEROSTATION.

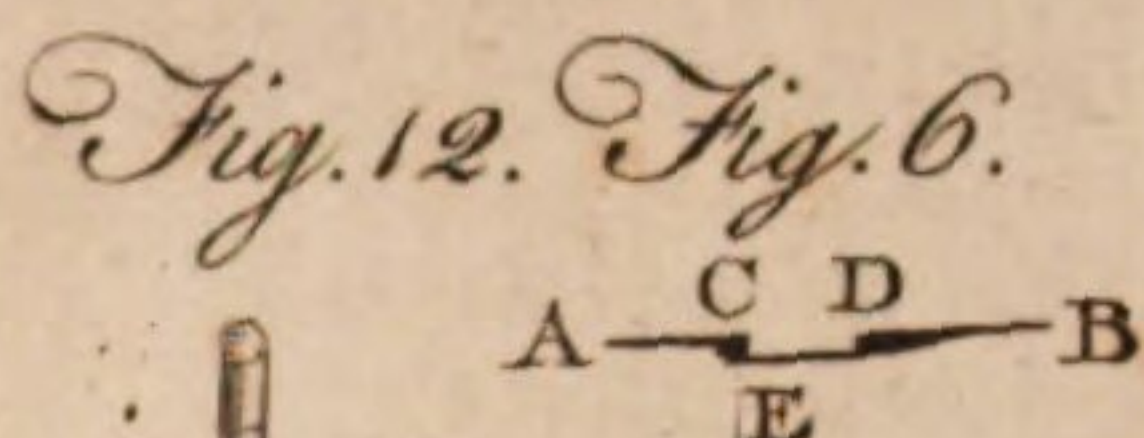
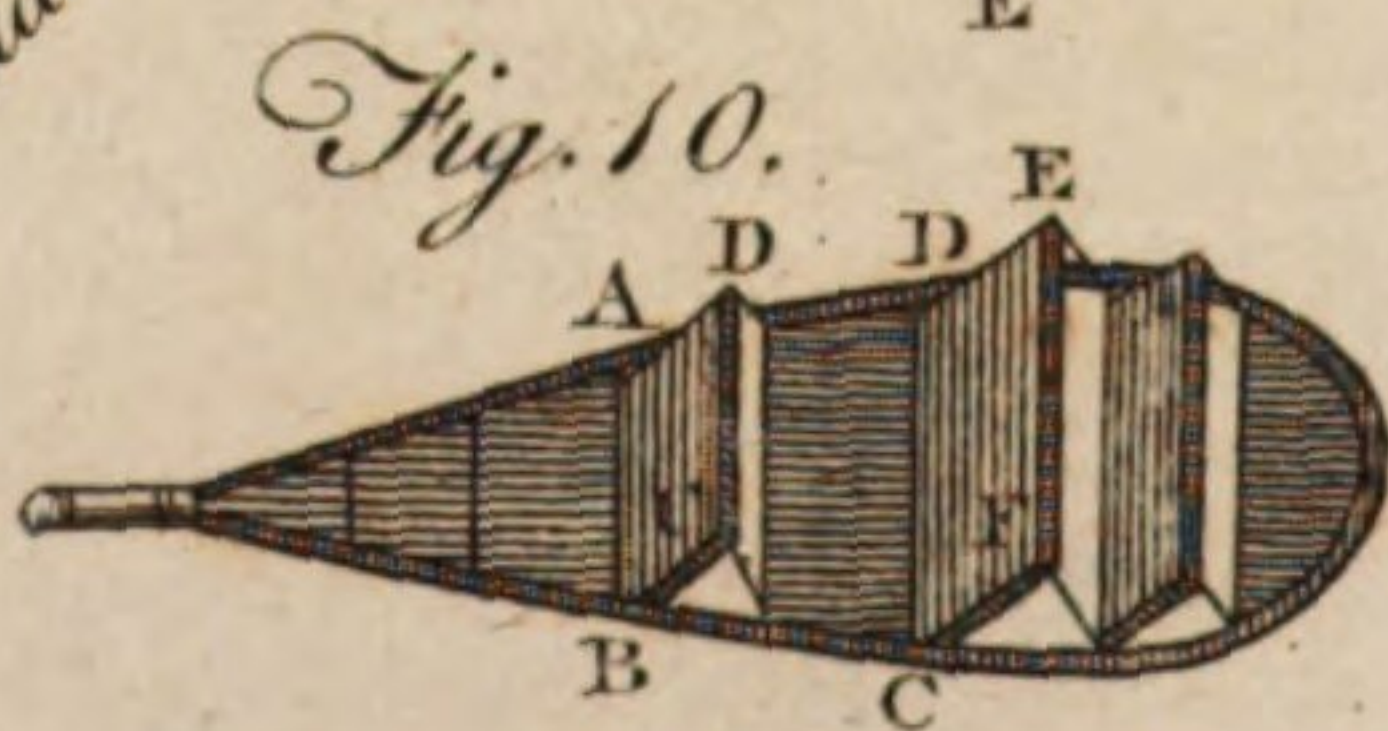
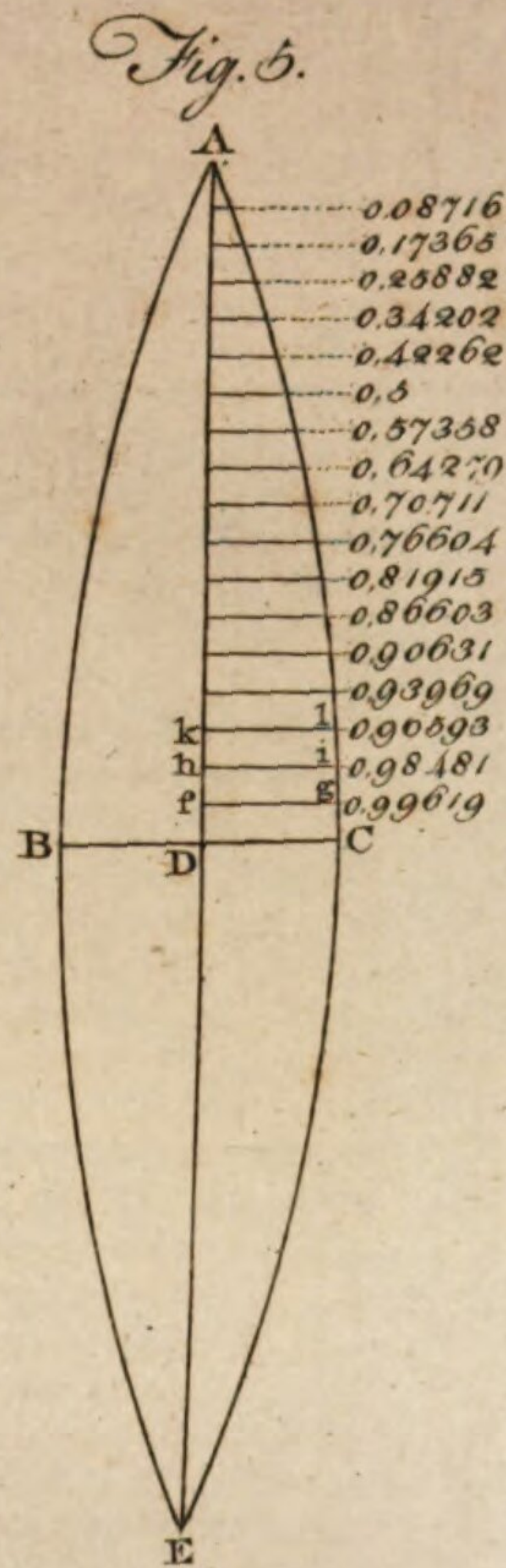


Fig. 13.



A View from a Balloon above the clouds, seen by Mr. Baldwin.



At Bell's Brethel at Sulphur Spring.

string or other security should be fixed to the shutter and the plate, so as not to admit the shutter to be opened beyond a certain safe distance. To the lower part of the balloon two pipes should be fixed, made of the same stuff as the envelope; 6 inches diameter for a balloon of 30 feet, and proportionally larger for balloons of a greater capacity. They must be long enough for the car. For balloons of 18 feet and less diameter, one neck or pipe will be sufficient. These pipes are the apertures through which the inflammable gas is introduced into the balloon.

The car or boat is best made of wicker-work, covered with leather, and well painted or varnished over; and the proper method of suspending it, is by ropes proceeding from the net which goes over the balloon. This net should be formed to the shape of the balloon, and fall down to the middle of it, with various cords proceeding from it to the circumference of a circle about two feet below the balloon; and from that circle other ropes should go to the edge of the boat. This circle may be made of wood, or of several pieces of slender cane bound together. The meshes of the net may be small at top, against which part of the balloon the inflammable air exerts the greatest force; and increase in size as they recede from the top. A hoop has sometimes been applied round the middle of the balloon to fasten the net. This, though not absolutely necessary, is best made of pieces of cane bound together, and covered with leather.

With regard to the rarefied-air machines, Mr Cavallo recommends first to soak the cloth in a solution of sal ammoniac and common size, using one pound of each to every gallon of water; and when the cloth is quite dry, to paint it over in the inside with some earthy colour, and strong size or glue. When this paint has dried perfectly, it will then be proper to varnish it with oily varnish, which might dry before it could penetrate quite through the cloth. Simple drying linseed oil will answer the purpose as well as any, provided it be not very fluid.

30
Of filling
aerostatic
machines.

It now only remains to give some account of the method by which aerostatic machines may be filled with their proper gas, in order to give them their power of ascending into the atmosphere; and here we are enabled to determine with much greater precision concerning the inflammable-air balloons than the others.

51
Methods of
procuring
inflammable
air.

With regard to them, a primary consideration is, the most proper method of procuring the inflammable air. It may be obtained in various ways, as has been shown under the article AEROLOGY: But the most advantageous methods are, by applying acids to certain metals; by exposing animal, vegetable, and some mineral substances, in a close vessel to a strong fire; or by transmitting the vapour of certain fluids through red-hot tubes.

1. In the first of these methods, iron, zinc, and vitriolic acid, are the materials most generally used. The vitriolic acid must be diluted by five or six parts of water. Iron may be expected to yield in the common way 1700 times its own bulk of gas; or one cubic foot of inflammable air to be produced by $4\frac{1}{2}$ ounces of iron, the like weight of oil of vitriol, and $22\frac{1}{2}$ ounces of water. Six ounces of zinc, an equal weight of oil of vitriol, and 30 ounces of water, are necessary for producing the same quantity of gas. It is more

VOL. I. Part I.

proper to use the turnings or chippings of great pieces of iron, as of cannon, &c. than the filings of that metal, because the heat attending the effervescence will be diminished; and the diluted acid will pass more readily through the interstices of the turnings when they are heaped together, than through the filings, which stick closer to one another. The weight of the inflammable air thus obtained by means of acid of vitriol, is, in the common way of procuring it, generally one seventh part of the weight of common air; but with the necessary precautions for philosophical experiments, less than one-tenth of the weight of common air. Two other sorts of elastic fluids are sometimes generated with the inflammable air. These may be separated from it by passing the inflammable air through water in which quicklime has been dissolved. The water will absorb these fluids, cool the inflammable air, and prevent its over-heating the balloon when introduced into it.

Fig. 7. of 2d Plate II. represents an apparatus described by Mr Cavallo as proper for filling balloons of the size of two or three feet in diameter with inflammable air, after passing it through water.—A is the bottle with the ingredients; BCD a tube fastened in the neck at B, and passing through C, the cork of the other bottle, in which there is another hole made to receive the tube on which the balloon is tied. Thus it is plain, that the inflammable air coming out of the tube D will pass first through the water of the bottle E and then into the balloon. Two small casks may be used instead of the bottles A and E.

2. Inflammable air may be obtained at a much cheaper rate by the action of fire on various substances; but the gas which these yield is not so light as that produced by the effervescence of acids and metals. The substances proper to be used in this way are, pit-coal, asphaltum, amber, rock-oil, and other minerals; wood, and especially oak, camphor-oil, spirits of wine, ether, and animal substances, which yield air in different degrees, and of various specific gravities; but pit-coal is the preferable substance. A pound of this exposed to a red heat, yields about three cubic feet of inflammable air, which, whether it be passed through water or not, weighs about one-fourth of the weight of common air. Dr Priestly found, as we have elsewhere noticed, that animal or vegetable substances will yield six or seven times more inflammable air when the fire is suddenly increased than when it is gently raised, though it be afterwards made very strong. Mr Cavallo observes, that the various substances above enumerated generally yield all their inflammable air in about one hour's time. The general method is, to inclose the substances in iron or earthen vessels, and thus expose them to a strong fire sufficient to make the vessels red-hot: the inflammable air proceeding from the aperture of the vessel is received into a tube or refrigerator, and, passing through the tube or worm, is at last collected in a balloon or other vessel. A gun-barrel has often been used for essays of this kind. The substance is put into it so as to fill six or eight inches of its lowest part, the remainder filled with dry sand: a tube, adapted to the mouth of the barrel, is brought into a basin of water under an inverted receiver; and the part of the barrel containing the substance being put into the fire and made red-hot, the inflammable air is collected

D d

lected in the inverted receiver. As the gun-barrel cannot serve for producing a large quantity of inflammable air, Mr Cavallo recommends, as the most advantageous shape, the following contrivance:—Let the vessel be made of clay, or rather of iron, in the shape of a Florence flask, somewhat larger, and whose neck is longer and larger (See ABC, fig. 8.) Put the substance to be used into this vessel, so as to fill about four-fifths or less of its cavity AB. If the substance is of such a nature as to swell much by the action of the fire, lute a tube of brass, or first a brass and then a leaden tube, to the neck C of the vessel; and let the end D of the tube be shaped as in the figure, so that going into the water of a tube HI, it may terminate under a sort of inverted vessel EF, to the upper aperture of which the balloon G is adapted. Things thus prepared, if the part AB of the vessel is put into the fire, and made red-hot, the inflammable air produced will come out of the tube CD, and passing through the water will at last enter into the balloon G. Previous to the operation, as a considerable quantity of common air remains in the inverted vessel EF, which it is more proper to expel, the vessel EF should have a stop-cock K, through which the common air may be sucked out, and the water ascend as high as the stop-cock. The dimensions of such an apparatus Mr Cavallo gives thus: Diameter of largest part of the vessel ABC seven inches, length of whole vessel 16 inches; diameter of its aperture one inch, diameter of the cavity of tube CD three-fourths of an inch; lower aperture of the vessel EF six inches, least height of the vessel EF 24 inches; its aperture F about two inches. The aperture of the vessel EF should be at least one foot below the surface of the water in HI. Care must be taken that the fire used in this process be at a sufficient distance, otherwise it may happen to fire the inflammable air which may escape out of the vessel EF.

3. The last method of obtaining inflammable air was lately discovered by Mr Lavoisier, and also by Dr Priestley. Mr Lavoisier made the steam of boiling water pass through the barrel of a gun, kept red-hot by burning coals. Dr Priestley uses, instead of the gun-barrel, a tube of red-hot brass, upon which the steam of water has no effect, and which he fills with the pieces of iron which are separated in the boring of cannon. By this method he obtains an inflammable air, the specific gravity of which is to that of common air as 1 to 13. In this method, not yet indeed reduced to general practice, a tube about three quarters of an inch in diameter, and about three feet long, is filled with iron turnings; then the neck of a retort, or close boiler, is luted to one of its ends, and the worm of a refrigeratory is adapted to its other extremity. The middle part of the tube is then surrounded with burning coals, so as to keep about one foot in length of it red-hot, and a fire is always made under the retort or boiler sufficient to make the water boil with vehemence. In this process a considerable quantity of inflammable air comes out of the worm of the refrigeratory. It is said that iron yields one half more air by this means than by the action of vitriolic acid.

For filling large balloons, a greater apparatus is necessary; and the only materials that can, with any certainty of success, be employed for producing the proper gas, are, oil of vitriol, and iron filings or turnings.

It has indeed been recommended to use zinc instead of iron filings, because white vitriol, the salt produced by the union of the vitriolic acid and zinc, is much more valuable than the green sort produced by the union of the same acid with iron. But though this is undoubtedly the case, it will as certainly be found, upon trial, that the superior price of the zinc will be more than an equivalent for all the advantage that can be derived from the additional price of the white vitriol. For a balloon of 30 feet diameter, Mr Cavallo recommends 3900 pounds of iron turnings, as much oil of vitriol, and 19,500 pounds of water. These proportions, however, appear too great with respect to the acid and metal, and too little with respect to the water. Oil of vitriol will not exert its power upon iron unless it be diluted with five or six times its quantity of water; in which case, a much smaller quantity of both acid and metal will serve. Mr Lunardi, who from the number of his voyages had certainly much practical knowledge in aerostation, filled his balloon at Edinburgh and Glasgow with about 2000 pounds of iron (the borings of cannon, procured from Carron), as much vitriolic acid, and 12,000 pounds of water. The iron was placed in his vessels in layers, with straw between them, in order to increase the surface. His apparatus was not materially different from that of Mr Cavallo, represented bottom of Plate I. fig. 2. where AA are two tubs, about three feet in diameter and nearly two feet deep, inverted in large tubs BB filled with water. In the bottom of each of the inverted tubs a hole is made, and a tube E of tin adapted, which is about seven inches in diameter, and seven or eight long. To these tubes the filken ones of the balloon are to be tied. Round each of the tubs B, five, six, or more strong casks are placed; in the top of each two holes are made, and to one of these holes a tin tube is adapted, and so shaped, that, passing over the edge of the tub B, and through the water, it may terminate with its aperture under the inverted tub A. The other hole of these casks serves for the introduction of materials, and is stopped with a wooden plug. When the balloon is to be filled, put the net over it, and let it be suspended as shown by CDF; and having expelled all the common air from it, let the filken tubes be fastened round the tin ones EE; and the materials being put into the casks, the inflammable air, passing into the balloon, will soon distend, and render it capable of supporting itself; after which the rope GH may be slipped off. As the balloon continues to be filled, the net is adjusted properly round it; the cords that surround it are fastened to the hoop MN; then the boat IK being placed between the two sets of casks, is fastened to the hoop MN, and every thing that is required to be sent up, as ballast, instruments, &c. is placed in it. At last, when the balloon is little more than three quarters full, the filken tubes are separated from the tin ones of the inverted tubs, and their extremities being tied up, are placed in the boat. Lastly, the aeronauts being seated in the boat, the lateral ropes are slipped off, and the machine is abandoned to the air. (See *Blanchard's balloon*, Plate II.) This apparatus was at last reduced by Mr Lunardi to its utmost simplicity, by using only two large casks, and suffering the vapour to go into the balloon without passing through water. Thus his balloon was filled

52
Mr Cavallo's receipt.

53
Mr Lunardi's method.

in less than half an hour, when, before, it had required two hours at least. The sinking of his casks in the ground was also an additional convenience, as it created no confusion, and rendered the materials much more easily conveyed into them.

54
Of filling
rarefied air
balloons.

With regard to the rarefied-air balloons, the method of filling them is as follows. A scaffold ABCD, the breadth of which is at least two-thirds of the diameter of the machine, is elevated about six or eight feet above the ground. From the middle of it descends a well E, rising about two or three feet above it, and reaching to the ground, furnished with a door or two, through which the fire in the well is supplied with fuel. The well should be constructed of brick or of plastered wood, and its diameter should be somewhat less than that of the machine. On each side of the scaffold are erected two masts HI, KL, each of which has a pulley at the top, and rendered firm by means of ropes KG, KP, HP, HG. The machine to be filled is to be placed on the scaffold, with its neck round the aperture of the well. The rope passing over the pulleys of the two masts, serves, by pulling its two ends, to lift the balloon about 15 feet or more above the scaffold; and the rest of the machine is represented by the dotted lines in the figure MNO. The machine is kept steady, and held down, whilst filling, by ropes passing through loops or holes about its equator; and these ropes may easily be disengaged from the machine, by slipping them through the loops when it is able to sustain itself. The proper combustibles to be lighted in the well, are those which burn quick and clear, rather than such as produce much smoke; because it is hot air, and not smoke, that is required to be introduced into the machine. Small wood and straw have been found to be very fit for this purpose. Mr Cavallo observes, as the result of many experiments with small machines, that spirits of wine are upon the whole the best combustible; but its price may prevent its being used for large machines. As the current of hot air ascends, the machine will soon dilate, and lift itself above the scaffold and gallery which was covered by it. The passengers, fuel, instruments, &c. are then placed in the gallery. When the machine makes efforts to ascend, its aperture must be brought, by means of the ropes annexed to it, towards the side of the well a little above the scaffold; the fire-place is then suspended in it, the fire lighted in the grate, and the lateral ropes being slipped off, the machine is abandoned to the air. (See *Montgolfier's balloon*, Plate II.) It has been determined by accurate experiments, that only one-third of the common air can be expelled from these large machines; and therefore the ascending power of the rarefied air in them can be estimated as only equal to half an ounce averdupoise for every cubic foot.

The conduct of balloons, when constructed, filled, and actually ascending in the atmosphere, is an object of great importance in the practice of aerostation. The method generally used for elevating or lowering the balloons with rarefied air, has been the increase or diminution of the fire; and this is entirely at the command of the aeronaut, as long as he has any fuel in the gallery. The inflammable-air balloons have been generally raised or lowered by diminishing the weight in the boat, or by letting out some of the gas through the valve: but the alternate escape of the air in de-

scending, and discharge of the ballast for ascending, will by degrees render the machine incapable of floating; for in the air it is impossible to supply the loss of ballast, and very difficult to supply that of inflammable air. These balloons will also rise or fall by means of the rarefaction or condensation of the inclosed air, occasioned by heat and cold. It has been proposed to aid a balloon in its alternate motion of ascent and descent, by annexing to it a vessel of common air, which might be condensed for lowering the machine, and rarefied again, by expelling part of it, for raising the machine: But a vessel adapted to this purpose must be very strong; and, after all, the assistance afforded by it would not be very considerable. M. Meunier, in order to attain this end, proposes to inclose one balloon filled with common air in another filled with inflammable air: as the balloon ascends, the inflammable air is dilated, and of course compresses the internal balloon containing the common air; and by diminishing its quantity, lessens its weight. If it should be necessary to supply this loss, he says it may be easily done by a pair of bellows fixed in the gallery. Others have proposed to annex a small machine with rarefied air to an inflammable-air balloon by ropes, at such a distance that the fire of the former might not affect the inflammable air of the latter: the whole apparatus, thus combined, of balloons formed on the two principles of heated and inflammable air, might be raised or lowered by merely increasing or diminishing the fire in the lower balloon.

Wings or oars are the only means of this sort that have been used with some success; and, as Mr Cavallo observes, they seem to be capable of considerable improvement. Although great effects are not to be expected from them, when the machine goes at a great rate, the best methods of moving those wings are by the human strength applied similarly to the oars of a waterman. They may be made in general of silk stretched between wires, tubes, or sticks; and when used, must be turned edgewise when they are moved in the direction in which the machine is intended to be impelled, but flat in the opposite direction. Fig. 9. 2d Plate II. is the representation of one of Mr Blanchard's wings. Fig. 10. is one of those used by Mr Lunardi, which consists of many silk shutters or valves, ABCD, DECF, &c. every one of which opens on one side only, viz. ADBC opens upon the line AB, DECF opens upon the line DC, &c. In consequence of this construction, this sort of oars do not need being turned edgewise. Fig. 11. represents one of the wings used by the brothers Roberts in the aerial voyage of the 19th September 1784; and fig. 12. represents one of the wings constructed by Count Zambecari, which consists of a piece of silk stretched between two tin tubes set at an angle; but these wings are so contrived as to turn edgewise by themselves when they go on one direction. Other contrivances have been made to direct aerostatic machines, but they have mostly been invented to effect a power upon them as upon a ship. It appears, however, that they can have no effect when a machine is only moved by the wind alone, because the circumambient air is at rest in respect to the machine. The case is quite different with a vessel at sea, because the water on which it floats stands still whilst the vessel goes on; but it must be time and experience that can realize the expectations suggested by these contrivances.

Aershot,
Æschines.

AERSHOT, a town in the Netherlands, in the duchy of Brabant, and capital of the duchy of Aershot. It is seated on the river Demur, ten miles east of Malines or Mechlin, and eight north of Louvain. E. Long. 5. 4. N. Lat. 51. 15.

ÆRUGINOUS, an epithet given to such things as resemble or partake of the nature of the rust of copper.

ÆRUGO, in natural history, properly signifies the rust of copper, whether natural or artificial. The former is found about copper mines, and the latter, called *verdegrijs*, made by corroding copper-plates with acids. See *Verdegrijs*.

ÆRUSCATORES, in antiquity, a kind of strolling beggars, not unlike gypsies, who drew money from the credulous by fortune-telling, &c. It was also a denomination given to griping exactors, or collectors of the revenue. The Galli, or priests of Cybele, were called *æruscatores magnæ matris*; and *μυτεργυγοί*, on account of their begging or collecting alms in the streets; to which end they had little bells whereby to draw peoples attention to them, much like some orders of mendicants abroad.

AERY, or **AIRY**, among sportsmen. See **AIRY**.

ÆS UXORIUM, in antiquity, a sum paid by bachelors, as a penalty for living single to old age. This tax for not marrying seems to have been first imposed in the year of Rome 350, under the censorship of M. Furius Camillus and M. Posthumus. At the census, or review of the people, each person was asked, *Et tu ex anima sententia uxorem habes liberum quærendorum causa?* He who had no wife was hereupon fined after a certain rate, called *æs uxorium*.

Æs per et libram was a formula in the Roman law, whereby purchases and sales are ratified. Originally the phrase seems to have been only used in speaking of things sold by weight, or by the scales; but it afterwards was used on other occasions. Hence even in adoptions, as there was a kind of imaginary purchase; the formula whereof expressed, that the person adopted was bought *per æs et libram*.

Æs Flavum, yellow copper, among the Romans, an appellation given to the coarser kinds of brass.

Æs Caldarium, a term used by the German mineralists, for a substance which sometimes occurs to those who work upon cobalt, and is used for the making the fine blue colour called *smalt*.

Æs Ustum, a chemical preparation, made of thin leaves of copper, sulphur, and nitre, placed *stratum super stratum* in a crucible, and set in a charcoal fire till all the sulphur is consumed; after which, the copper is taken out of the crucible, and reduced to powder. Some quench the leaves of copper in vinegar, and repeat the calcination.—Its principal use is in colouring glass, to which it gives a beautiful tincture. The surgeons use it as a deterfive, and some have given it internally; but it is certainly a very dangerous medicine, and should be avoided.

ÆSCHINES, a Socratic philosopher, the son of Charinus a sausage-maker. He was continually with Socrates; which occasioned this philosopher to say, that the sausage-maker's son was the only person who knew how to pay a due regard to him. It is said that poverty obliged him to go to Sicily to Dionysius the Tyrant; and that he met with great contempt from Plato, but was extremely well received by Aristippus; to whom

he showed some of his dialogues, and received from him *Æschylus*. a handsome reward. He would not venture to profess philosophy at Athens, Plato and Aristippus being in such high esteem; but he set up a school to maintain himself. He afterwards wrote orations for the Forum. Phrynicius, in Photius, ranks him amongst the best orators, and mentions his orations as the standard of the pure Attic style. Hermogenes has also spoken very highly of him.—He also wrote several Dialogues, of which there are only three extant: 1. Concerning virtue, whether it can be taught. 2. Eryxias, or Erasistratus; concerning riches, whether they are good. 3. Axiochus; concerning death, whether it is to be feared. Mr Le Clerc has given a Latin translation of them, with notes and several dissertations, intitled *Sylvæ Philologicæ*.

ÆSCHYLUS, the tragic poet, was born at Athens. Authors differ in regard to the time of his birth, some placing it in the 65th, others in the 70th Olympiad; but according to Stanly, who relies on the Arundelian marbles, he was born in the 63d Olympiad. He was the son of Euphorion, and brother to Cynegeirus and Aminias, who distinguished themselves in the battle of Marathon, and the sea-fight of Salamis, at which engagements *Æschylus* was likewise present. In this last action, according to Diodorus Siculus, Aminias, the younger of the three brothers, commanded a squadron of ships, and behaved with so much conduct and bravery, that he sunk the admiral of the Persian fleet, and signalized himself above all the Athenians. To this brother our poet was, upon a particular occasion, obliged for saving his life: *Ælian* relates, that *Æschylus* being charged by the Athenians with certain blasphemous expressions in some of his pieces, was accused of impiety, and condemned to be stoned to death: they were just going to put the sentence in execution, when Aminias, with a happy presence of mind, throwing aside his cloak, showed his arm without a hand, which he had lost at the battle of Salamis in defence of his country. This sight made such an impression on the judges, that, touched with the remembrance of his valour, and with the friendship he showed for his brother, they pardoned *Æschylus*. Our poet, however, resented the indignity of this prosecution, and resolved to leave a place where his life had been in danger. He became more determined in this resolution when he found his pieces less pleasing to the Athenians than those of Sophocles, tho' a much younger writer. Some affirm, that *Æschylus* never sat down to compose but when he had drank liberally. He wrote a great number of tragedies, of which there are but seven remaining: and notwithstanding the sharp censures of some critics, he must be allowed to have been the father of the tragic art. In the time of Thespis, there was no public theatre to act upon; the strollers driving about from place to place in a cart. *Æschylus* furnished his actors with masks, and dressed them suitably to their characters. He likewise introduced the buskin, to make them appear more like heroes.—The ancients gave *Æschylus* also the praise of having been the first who removed murders and shocking fights from the eyes of the spectators. He is said likewise to have lessened the number of the chorus. M. Le Fevre has observed, that *Æschylus* never represented women in love in his tragedies; which, he says, was not suited to his genius; but, in representing a woman transported with fury, he was incomparable. Longius says, that *Æschylus*

Æschynomene.

Æschylus has a noble boldness of expression; and that his imagination is lofty and heroic. It must be owned, however, that he affected pompous words, and that his sense is too often obscured by figures: this gave Salmastius occasion to say, that he was more difficult to be understood than the scripture itself. But notwithstanding these imperfections, this poet was held in great veneration by the Athenians, who made a public decree that his tragedies should be played after his death. He was killed in the 69th year of his age, by an eagle letting fall a tortoise upon his head as he was walking in the fields. He had the honour of a pompous funeral from the Sicilians, who buried him near the river Gela; and the tragedians of the country performed plays and theatrical exercises at his tomb.—The best edition of his plays is that of London, 1663, fol. with a Latin translation and a learned commentary by Thomas Stanly.

ÆSCHYNOMENE, BASTARD SENSITIVE-PLANT:

A genus of the decandria order, belonging to the diadelphica class of plants; the characters of which are: The *calyx* is a one-leaved campanulated bilabiated perianthium; the lips equal, but the superior one two-cleft, the inferior tridentate. The *corolla* is papilionaceous; the banner cordated and suberect; the *ala* ovate, obtuse, and shorter than the banner; and the *carina* lunated, pointed, and the length of the *ala*. The *stamina* consist of ten simple nine-cleft filaments; the antheræ small. The *pistillum* is an oblong vilous columnar germen; the stylus subulated and ascending, the stigma simple and somewhat obtuse. The *pericarpium* is a long compressed, unilocular jointed pod. The *seeds* are kidney-shaped, and solitary within each joint. Of this genus there are reckoned six

Species. 1. The *aspera* (as well as the rest of this genus) is a native of warm countries. It rises to the height of four or five feet, having a single herbaceous stalk, which is rough in some parts. The leaves come out on every side towards the top, forming a sort of head; the flowers come out between the leaves, two or three together upon long foot-stalks; they are yellow, and shaped like those of peas: after the flower is past, the germen becomes a flat jointed pod, which, when ripe, parts at the joints, and in each division is lodged a single kidney-shaped seed. 2. The *Americana*, seldom rises more than two feet in height. The flowers come out from the leaves on branching footstalks, five or six together; these are much less than the former, and of a paler yellow colour. The seed is lodged in pods like the other. 3. The *arborea*, grows to the height of six or seven feet, with a single stem; the flowers come out two or three together, of a copper colour, and as large as those of the *aspera*. 4. The *sesban* hath woody stems, and branches garnished with smooth leaves. The flowers are small, of a deep yellow colour, and come out on long spikes hanging downward. The seed is contained in a smooth pod not jointed. 5. The *pumila*, rises to the height of about three feet; has flowers of a pale yellow colour, which come out sometimes single, at other times two or three upon each footstalk. The seeds are contained in a long falcated pod having 13 or 14 divisions, each of which lodges a single seed. 6. The *grandiflora*, rises six or eight feet high, with a woody stem, sending out branches towards the top, garnished with obtuse leaves. The flowers are large, yellow, and

succeeded by large pods containing kidney-shaped seeds. *Culture.* These plants are propagated by seeds, which should be sown early in the spring, on a hot-bed; and when the plants have strength enough to be removed, they should each be put into a separate pot filled with light earth, and plunged into a hot-bed. As they increase in size, they must be removed into larger pots: but if these are too large, the plants will not thrive. They must be brought forward early in the year, otherwise the second kind will not perfect its seed.

ÆSCULAPIUS, in the Heathen mythology, the god of physic, was the son of Apollo and the nymph Coronis. He was educated by the centaur Chiron, who taught him physic; by which means Æsculapius cured the most desperate diseases. But Jupiter, enraged at his restoring to life Hippolitus, who had been torn in pieces by his own horses, killed him with a thunder-bolt. According to Cicero, there were three deities of this name: the first, the son of Apollo, worshipped in Arcadia, who invented the probe, and bandages for wounds; the second, the brother of Mercury, killed by lightning; and the third, the son of Arisippus and Arsinoe, who first taught the art of tooth-drawing and purging. At Epidaurus, Æsculapius's statue was of gold and ivory, with a long beard, his head surrounded with rays, holding in one hand a knotty stick, and the other entwined with a serpent; he was seated on a throne of the same materials as his statue, and had a dog lying at his feet. The Romans crowned him with laurel, to represent his descent from Apollo; and the Phalians represented him as beardless. The cock, the raven, and the goat, were sacred to this deity. His chief temples were at Pergamus, Smyrna, Trica, a city in Ionia, and the isle of Coos; in all which votive tablets were hung up, showing the diseases cured by his assistance. But his most famous shrine was at Epidaurus; where, every five years, games were instituted to him, nine days after the Isthmian games at Corinth.

ÆSCULUS, the HORSE-CHESTNUT: A genus of the monogynia order, belonging to the heptandria class of plants; and ranking, in the natural method, under the 39th order, *Tribilata*.—The characters are: The *calyx* is a small, single-leaved, bellied perianthium, divided into five segments. The *corolla* (except in the *pavia*, where it is four-petal'd and close) consists of five roundish, flat, expanding petals, unequally coloured, and with narrow claws inserted into the calyx. The *stamina* have seven subulated declining filaments, the length of the corolla; the antheræ ascending. The *pistillum* is a roundish germen, ending in a subulated stylus; the stigma pointed. The *pericarpium* is a leathery, roundish, trilocular, three-valved capsule. The *seeds* are two, and subglobular.—In this genus Van Rozen and Miller observe both male and hermaphrodite flowers. There are two

Species. 1. The *hippocastanum*, or common horse-chestnut. It was brought from the northern parts of Asia about the year 1550, and sent to Vienna about 1588. This tree makes a noble appearance all the month of May, the extremities of the branches being terminated by fine spikes of flowers spotted with rose colours, so that the whole tree seems covered with them. It is quick in its growth; so that in a few years it arrives at a size large enough to afford a good shade in summer,

Æsculapius.

Æsculus summer, as also to produce plenty of flowers. They have, however, this great inconvenience, that their wood is of no use, being unfit even for burning; and their leaves beginning to fall in July, soon deprive the trees of their beauty. There is something very singular in the growth of these trees; which is, that the whole shoot is performed in less than three weeks after the buds are opened.—The nuts are reckoned good food for horses. In Turkey, they are ground, and mixed with the provender of these animals, especially those which are troubled with coughs or broken winded. Deer are also very fond of the fruit; and at the time of their ripening keep much about the trees, but especially in strong winds, when the nuts are blown down, which they carefully watch, and greedily devour as they fall.

2. The pavia, or scarlet flowering horse-chestnut, a native of Carolina, the Brasils, and the East. It grows to about fifteen or sixteen feet high; and there is a delicacy in this tree that makes it desirable. The bark of the young shoots is quite smooth, and the growing shoots in summer are of a reddish hue. The leaves are palmated, being pretty much like those of the horse-chestnut, only much smaller, and the indentures at the edges are deeper and more acute. The lobes of which they are composed are spear-shaped; they are five in number, are united at their base, and stand on a long red footstalk. The leaves grow opposite by pairs on the branches, which are spread abroad on every side. The flowers come out from the ends of the branches. The first appearance of the buds is in May; though they will not be in full blow till the middle of June. They are of a bright red colour, and consequently have a pleasing effect among the vast tribe of yellow-flowering sorts which show themselves in bloom at that season. They continue in succession for upwards of six weeks; and sometimes are succeeded by ripe seeds in our gardens.

Propagation and culture. The first species is propagated from the nuts. In autumn, therefore, when they fall, a sufficient quantity should be gathered. These should be sown soon afterwards in drills, about two inches asunder. If the nuts are kept till spring, many of them will be faulty; but where the seminary-ground cannot be got ready before, and they are kept so long, it may be proper to put them in water, to try their goodness. The good nuts will sink, whilst those which are faulty will swim; so that by proving them this way you may be sure of good nuts, and have more promising hopes of a crop. In the spring the plants will come up; and when they have stood one year, they may be taken up, their top-roots shortened, and afterwards planted in the nursery. When they are of sufficient size to be planted out finally, they must be taken out of the nursery with care, the great side-shoots and the bruised parts of the roots should be taken off, and then planted in large holes level with the surface of the ground at the top of their roots; the fibres being all spread and lapped in the fine mold, and the turf also worked to the bottom. A stake should be placed to keep them safe from the winds; and they must be fenced from the cattle till they are of a sufficient size to defend themselves. The best season for all this work is October. After the trees are planted, neither knife nor hatchet should come near them; but

they should be left to Nature to form their beautiful parabolic heads, and assume their utmost beauty.—The horse-chestnut, like most other trees, delights most in good fat land; but it will grow exceedingly well on clayey and marley grounds.

Miller says, "When these trees are transplanted, their roots should be preserved as entire as possible, for they do not succeed well when torn or cut: nor should any of the branches be shortened, for there is scarce any tree that will not bear amputation better than this; so that when any branches are by accident broken, they should be cut off close to the stem, that the wound may heal over."

The second species is propagated, 1. By budding it upon the young plants of the horse-chestnut. These stocks should be raised as was directed in that article. They should be planted in the nursery way, one foot asunder, and two feet distant in the rows, which should be kept clean of weeds, and must be dug between every winter till the operation is to be performed. After they have stood in the nursery-ground about two years, and have made at least one good summer's shoot, the summer following is the time for the operation. Then, having your cuttings ready soon after midsummer, the evenings and cloudy weather should be made choice of for the work. Whoever has a great number of trees to inoculate, must regard no weather, but keep working on, to get his business over before the season ends; and, indeed, a good hand will be always pretty sure of success be the weather what it will. If the stocks were healthy, the summer following they will make pretty good shoots; and in a year or two after that will flower. This is one method of propagating this tree; and those plants that are propagated this way will grow to a larger size than those raised immediately from seeds.—2. This tree also may be propagated by seeds; which will sometimes ripen with us, and may be obtained out of our own gardens. The manner of raising them this way is as follows: Let a warm border be prepared; and if it is not naturally sandy, let drift-sand be mixed with the soil; and in this border let the seeds be sown in the month of March, about half an inch deep. After this, constant weeding must be observed; and when the plants are come up, if they could be shaded in the heat of the day, it would be much better. These, with now and then a gentle watering in a dry season, will be all the precautions they will require the first summer. The winter following, if the situation is not extremely well sheltered, protection must be given them from the hard black frosts, which will otherwise often destroy them; so that it will be the safest way to have the bed hooped, to cover them with mats in such weather, if the situation is not well defended; if it is, this trouble may be saved; for, even when young, they are tolerably hardy. In about two or three years they may be removed into the nursery, or planted where they are to remain, and they will flower in three or four years after. The usual nursery care must be taken of them when planted in that way; and the best time for planting them there, or where they are to remain, is October; though they will grow exceeding well if removed in any of the winter months; but, if planted late in the spring, they will require more watering, as the ground will not be so regularly settled

Æsop. settled to the roots as if they had been planted earlier.

ÆSOP, the Phrygian, lived in the time of Solon, about the 50th Olympiad, under the reign of Cræsus the last king of Lydia. As to genius and abilities, he was greatly indebted to nature; but in other respects not so fortunate, being born a slave and extremely deformed. St Jerom, speaking of him, says he was unfortunate in his birth, condition in life, and death; hinting thereby at his deformity, servile state, and tragical end. His great genius, however, enabled him to support his misfortunes; and in order to alleviate the hardships of servitude, he composed those entertaining and instructive fables which have acquired him so much reputation. He is generally supposed to have been the inventor of that kind of writing; but this is contested by several, particularly Quintilian, who seems to think that Hesiod was the first author of fables. *Æsop*, however, certainly improved this art to a very great degree; and hence it is that he has been accounted the author of this sort of productions:

*Æsopus auctor quam materiam reperit,
Hanc ego pollivi versibus senariis.*

Phed. Prol. ad. lib. i.

If any thoughts in these iambs shine,
Th' invention's *Æsop*'s, and the verse is mine.

The first master whom *Æsop* served, was one Caræus Demarchus, an inhabitant of Athens; and there in all probability he acquired his purity in the Greek tongue. After him he had several masters; and at length came under a philosopher named Idmon or Iadmon, who enfranchised him. After he had recovered his liberty, he soon acquired a great reputation amongst the Greeks; so that, according to Meziriac, the report of his wisdom having reached Cræsus, he sent to enquire after him, and engaged him in his service. He travelled through Greece, according to the same author; whether for his own pleasure, or upon the affairs of Cræsus, is uncertain; and passing by Athens soon after Pisistratus had usurped the sovereign power, and finding that the Athenians bore the yoke very impatiently, he told them the fable of the frogs who petitioned Jupiter for a king. The images made use of by *Æsop* are certainly very happy inventions to instruct mankind; they possess all that is necessary to perfect a precept, having a mixture of the useful with the agreeable. "*Æsop* the fabulist (says Aulus Gellius) was deservedly esteemed wise, since he did not, after the manner of the philosophers, rigidly and imperiously dictate such things as were proper to be advised and persuaded; but, framing entertaining and agreeable apologues, he thereby charms and captivates the human mind."—*Æsop* was put to death at Delphi. Plutarch tells us, that he came there with a great quantity of gold and silver, being ordered by Cræsus to offer a sacrifice to Apollo, and to give a considerable sum to each inhabitant: but a quarrel arising betwixt him and the Delphians, he sent back the money to Cræsus; for he thought those for whom the prince designed it, had rendered themselves unworthy of it. The inhabitants of Delphi contrived an accusation of sacrilege against him; and pretending they had convicted him, threw him headlong from a rock. For this cruelty and injustice, we are told they were visited with famine and pestilence; and consulting the oracle, they received for answer, that the god de-

signed this as a punishment for their treatment of *Æsop*: they endeavoured to make an atonement, by raising a pyramid to his honour.

ÆSOP (Clodius), a celebrated actor, who flourished about the 670th year of Rome. He and Roscius were cotemporaries, and the best performers who ever appeared upon the Roman stage, the former excelling in tragedy, the latter in comedy. Cicero put himself under their direction to perfect his action. *Æsop* lived in a most expensive manner, and at one entertainment is said to have had a dish which cost above eight hundred pounds; this dish, we are told, was filled with singing and speaking birds, some of which cost near 50*l*. The delight which *Æsop* took in this sort of birds proceeded, as Mr Bayle observes, from the expence. He did not make a dish of them because they could speak, according to the refinement of Pliny upon this circumstance, this motive being only by accident; but because of their extraordinary price. If there had been any birds that could not speak, and yet more scarce and dear than these, he would have procured such for his table. *Æsop*'s son was no less luxurious than his father, for he dissolved pearls for his guests to swallow. Some speak of this as a common practice of his; but others mention his falling into this excess only on a particular day, when he was treating his friends. Horace* speaks only of one pearl of great value, which he dissolved in vinegar, and drank. *Æsop*, notwithstanding his expences, is said to have died worth above 160,000*l*. When he was upon the stage, he entered into his part to such a degree, as sometimes to be seized with a perfect extacy: Plutarch mentions it as reported of him, that whilst he was representing Atreus deliberating how he should revenge himself on Thyestes, he was so transported beyond himself in the heat of action, that with his truncheon he smote one of the servants crossing the stage, and laid him dead on the spot.

ÆSTIMATIO CAPITIS, a term met with in old law-books for a fine anciently ordained to be paid for offences committed against persons of quality, according to their several degrees.

ÆSTIVAL, in a general sense, denotes something connected with, or belonging to, summer. Hence æstival sign, æstival solstice, &c.

ÆSTUARIA, in geography, denotes an arm of the sea, which runs a good way within land. Such is the Bristol channel, and many of the friths of Scotland.

ÆSTUARIES, in ancient baths, were secret passages from the hypocaustum into the chambers.

ÆSTUARY, among physicians, a vapour-bath, or any other instrument for conveying heat to the body.

ÆSYMNIUM, in antiquity, a monument erected to the memory of the heroes, by *Æsymnus* the Megarean. He consulting the oracle in what manner the Megareans might be most happily governed, was answered, *If they held consultation with the more numerous*: whom he taking for the dead, built the said monument, and a senate-house that took within its compass the monument; imagining, that thus the dead would assist at their consultations. (Pausanias.)

ÆETH, or *ATH*, a strong little town in the Austrian Netherlands and province of Hainault, situated on the river Dender, about twenty miles S. W. of Brussels.

ÆTHALIA, or *ILVA*, (anc. geog.) now *Elba*; an island

Æsop,
Æthalia.

* Sat. ii.
lib. ii. 239.

Æthelstan, island on the coast of Etruria, in compass an hundred miles, abounding in iron, as Elba still does. **Stephanus** calls it *Aethale*. The port of Aethalia was called *Argous*, (Diod. Sicul.)

ÆTHELSTAN, see **ATHELSTAN**.

ÆTHER, is usually understood of a thin, subtile matter, or medium, much finer and rarer than air; which commencing from the limits of our atmosphere, possesses the whole heavenly space.—The word is Greek, *αιθρ*, supposed to be formed from the verb *αιθρ*, “to burn, to flame;” some of the ancients, particularly Anaxagoras, supposing it of the nature of fire. See **FIRE**.

The philosophers cannot conceive that the largest part of the creation should be perfectly void; and therefore they fill it with a species of matter under the denomination of *æther*. But they vary extremely as to the nature and character of this *æther*. Some conceive it as a body *sui generis*, appointed only to fill up the vacuities between the heavenly bodies; and therefore confined to the regions above our atmosphere. Others suppose it of so subtile and penetrating a nature, as to pervade the air, and other bodies, and possess the pores and intervals thereof. Others deny the existence of any such specific matter; and think the air itself, by that immense tenuity and expansion it is found capable of, may diffuse itself through the interstellar spaces, and be the only matter found therein.

In effect, *æther*, being no object of our sense, but the mere work of imagination, brought only upon the stage for the sake of hypothesis, or to solve some phenomenon, real or imaginary; authors take the liberty to modify it how they please. Some suppose it of an elementary nature, like other bodies; and only distinguished by its tenuity, and the other affections consequent thereon: which is the philosophical *æther*. Others will have it of another species, and not elementary; but rather a sort of fifth element, of a purer, more refined, and spirituous nature, than the substances about our earth: and void of the common affections thereof, as gravity, &c. The heavenly spaces being the supposed region or residence of a more exalted class of beings, the medium must be more exalted in proportion. Such is the ancient and popular idea of *æther*, or ætherial matter.

The term *æther* being thus embarrassed with a variety of ideas, and arbitrarily applied to so many different things, the later and severer philosophers choose to set it aside, and in lieu thereof substitute other more determinate ones. Thus, the Cartesians use the term *materia subtilis*; which is their *æther*: and Sir Isaac Newton, sometimes a *subtile spirit*, as in the close of his *Principia*; and sometimes a *subtile* or *ætherial medium*, as in his *Optics*.

The truth is, there are abundance of considerations, which seem to evince the existence of some matter in the air, much finer than the air itself. There is an unknown something, which remains behind when the air is taken away; as appears from certain effects which we see produced *in vacuo*. Heat, Sir Isaac Newton observes, is communicated through a vacuum almost as readily as through air: but such communication cannot be without some interjacent body, to act as a medium. And such body may be subtile enough to penetrate the pores of glass; and may be very well con-

N° 6.

cluded to permeate those of all other bodies, and consequently be diffused through all the parts of space which answers to the full character of an *æther*. See **HEAT**.

The existence of such an ætherial medium being settled, that author proceeds to its properties; inferring it to be not only rarer and more fluid than air, but exceedingly more elastic and active: in virtue of which properties, he shows, that a great part of the phenomena of nature may be produced by it. To the weight, *e. g.* of this medium, he attributes gravitation, or the weight of all other bodies; and to its elasticity, the elastic force of the air and of nervous fibres, and the emission, refraction, reflection, and other phenomena of light; as also, sensation, muscular motion, &c. In fine, this same matter seems the *primum mobile*, the first source or spring of physical action in the modern system.

The Cartesian *æther* is supposed not only to pervade, but adequately to fill, all the vacuities of bodies; and thus to make an absolute plenum in the universe.

But Sir Isaac Newton overturns this opinion, from divers considerations; by showing, that the celestial spaces are void of all sensible resistance: for, hence it follows, that the matter contained therein must be immensely rare, in regard the resistance of bodies is chiefly as their density; so that if the heavens were thus adequately filled with a medium or matter, how subtile soever, they would resist the motion of the planets and comets much more than quicksilver or gold.

The late discoveries in electricity have thrown great light upon this subject, and rendered it extremely probable that the *æther* so often talked of is no other than the electric fluid, or solar light, which diffuses itself throughout the whole system of nature. See **ELECTRICITY**, **FIRE**, **HEAT**, **LIGHT**, &c.

ÆTHER, in chemistry, the lightest, most volatile, and most inflammable of all liquids, is produced by distillation of acids with rectified spirit of wine. See **CHEMISTRY** and **PHARMACY** (the *Indexes*).

ÆTHERIAL, **ETHERIUS**, something that belongs to, or partakes of, the nature of **ÆTHER**. Thus we say, the *ætherial space*, *ætherial regions*, &c.

Some of the ancients divided the universe, with respect to the matter contained therein, into elementary and ætherial.

Under the ætherial world was included all that space above the uppermost element, viz. fire. This they supposed to be perfectly homogeneous, incorruptible, unchangeable, &c. See **CORRUPTION**. The Chaldees placed an ætherial world between the empyreum and the region of the fixed stars. Beside which, they sometimes also speak of a second ætherial world, meaning by it the starry orb: and a third ætherial world, by which is meant the planetary region.

ÆTHIOPIA. See **ETHIOPIA**.

ÆTHIOPS, *Mineral*, *Martial*, and *Antimonial*. See **PHARMACY** (*Index*).

ÆTHUSA, in botany, a genus of the pentandria digynia class; and, in the natural method, ranking under the 45th order, *Umbellatæ*. The characters are: The *calyx* is an universal umbel expanding, the interior rays shorter by degrees; with a partial umbel, small, and expanding. There is no universal involucre; the partial one is dimidiated, with three or five leaflets,

Æther,
|
Æthusa.

Aetians, lets, and pendulous; the proper perianthium scarcely discernible. The universal *corolla* is uniform, with fertile florets; the partial one has five heart-inflected unequal petals. The *stamina* consist of five simple filaments, with roundish antheræ. The *pistillum* is a germen beneath; with two reflected styli; the stigmata obtuse. There is no *pericarpium*; the fruit is ovate, striated, and tripartite. The *seeds* are two, roundish and striated. There is but one species, viz. the *æthusa synapium*, fools-parsley, or lesser hemlock (a native of Britain), which grows in corn-fields and gardens. This plant, from its resemblance to common parsley, hath sometimes been mistaken for it; and when eaten, it occasions sickness. If the curled-leaved parsley, only was cultivated in our gardens, no such mistakes would happen in future. Cows, horses, sheep, goats, and swine, eat it. It is noxious to geese.

AETIANS, in church-history, a branch of Arians who maintained, that the Son and Holy Ghost are in all things dissimilar to the Father. See **AETIUS**.

ÆTIOLOGY, is that part of Pathology which is employed in exploring the causes of diseases.

AETION, a celebrated painter, who has left us an excellent picture of Roxana and Alexander, which he exhibited at the Olympic Games: it represents a magnificent chamber, where Roxana is sitting on a bed of a most splendid appearance, which is rendered still more brilliant by her beauty. She looks downwards, in a kind of confusion, being struck with the presence of Alexander standing before her. A number of little Cupids flutter about, some holding up the curtain, as if to show Roxana to the prince, whilst others are busied in undressing the lady; some pull Alexander by the cloak, who appears like a young bashful bridegroom, and present him to his mistress: he lays his crown at her feet, being accompanied by Ephektion, who holds a torch in his hand, and leans upon a youth, who represents Hymen. Several other little Cupids are represented playing with his arms; some carry his lance, stooping under so heavy a weight; others bear along his buckler, upon which one of them is seated, whom the rest carry in triumph; another lies in ambush in his armour, waiting to frighten the rest as they pass by. This picture gained Aetion so much reputation, that the president of the games gave him his daughter in marriage.

ÆTITES, or **EAGLE-STONE**, in natural history, a flinty or crustated stone, hollow within, and containing a *nucleus*, which, on shaking, rattles within. It was formerly in repute for several extraordinary magical as well as medical powers; such as preventing abortion, discovering thieves, and other ridiculous properties. The word is formed from *æt*, "eagle;" the popular tradition being, that it is found in the eagle's nest, whether it is supposed to be carried while the female sits, to prevent her eggs from being rotten. It is found in several parts: near Trevoux in France, one can scarce dig a few feet, without finding considerable strata or beds of the coarser or ferruginous kind. They are originally soft, and of the colour of yellow oaker. But the finest and most valued of all the eagle-stones, are accidental states of one or other of our common pebbles.

AETIUS, one of the most zealous defenders of Arianism, was born in Syria, and flourished about the year 330. After being servant to a grammarian, of

whom he learned grammar and logic, he was ordained deacon, and at length bishop, by Eudoxus patriarch of Constantinople. St Epiphanius has preserved 47 of his propositions against the Trinity. His followers were called **AETIANS**.

AETIUS, a famous physician, born at Amida in Mesopotamia, and the author of a work intitled *Tetrabiblos*, which is a collection from the writings of those physicians who went before him. He lived, according to Dr Freind, at the end of the 5th or the beginning of the 6th century.

AETIUS, governor of Gallia Narbonensis in the reign of Valentinian III. forced the Franks who were passing into Gaul to repass the Rhine. He defeated the Goths; and routed Attila king of the Huns, who invaded Gaul with an army of 700,000 men. But the emperor, jealous of the merit of this great man, killed him in 454 with his own hand, under the pretence that he had permitted the invasion of the Huns, after Attila's defeat.

ÆTNA, (in the Itineraries *Æthana*, supposed from *æt*, "to burn;" according to Bochart, from *Athuna*, a furnace, or *Ætuna*, darkness), now *Monte Gibello*: a volcano or burning mountain of Sicily, situated in lat. 38°. N. long. 15°. E.

This mountain, famous from the remotest antiquity, both for its bulk and terrible eruptions, stands in the eastern part of the island, in a very extensive plain, called *Val Demoni*, from the notion of its being inhabited by devils, who torment the spirits of the damned in the bowels of this volcano.

Concerning the dimensions of mount *Ætna*, we can scarce extract any thing consistent, even from the accounts of the latest and most ingenious travellers. Pin-dar, who lived about 435 years before Christ, calls it the *Pillar of Heaven*, on account of its great height. All modern writers likewise agree, that this mountain is very high, and very large; but differ excessively both as to its height and magnitude: some making it no less than twelve miles high, others eight, others six, some four, while Mr Brydone, and Sir William Hamilton, who lately ascended to its highest summit, reduce its height to little more than two miles; nay, by some it is reduced to 10,036 feet, somewhat less than two miles. No less remarkable are the differences concerning its circumference! some making it only 60 miles round, others 100; and Signior Recupero, from whom Mr Brydone had his information in this respect, affirms it to be no less than 183 miles in circuit.

We are sorry to detract from the merit of Mr Brydone, or to involve in obscurity what he hath been at so much pains to elucidate; but every person who compares the account of mount *Ætna*'s circumference, given by Signior Recupero, and to which Mr Brydone seems to have assented, with its apparent circumference on the map prefixed to that gentleman's tour through Sicily and Malta, must at once be struck with the prodigious disparity. Indeed, it is plain, that, in the map, the geographer hath not left room for any such mountain: nor can we help thinking, that, by comparing the distances of some of the Sicilian towns from one another, Signior Recupero's dimensions will be found enormously exaggerated.—Certain it is, that there the geographer hath placed Catania, which stands at the foot of mount *Ætna*, on one side, no more than 28 miles from the most distant point of the river Alcan-

Aetius,
Ætna.

Ætna. tara, which forms the boundary on the opposite side; so that a circle, whose radius is 14 or 15 miles, must encompass as much space as we can possibly think is occupied by the basis of mount *Ætna*. Thus we will reduce the circumference of this famous mountain to between 80 and 90 miles; and even when we do so, it must still be acknowledged to be very great.

But if we are embarrassed with the circumference of *Ætna*, we are much more so with the accounts relating to its height; and one circumstance, particularly, creates almost insurmountable difficulties. It is agreed upon by all travellers, and among the rest by Sir William Hamilton, that from Catania, where the ascent first begins, to the summit, is not less than 30 miles. The descent on the other side we have no account of; but, whatever supposition we make, the height of the mountain must be prodigious. If we suppose it likewise to be 30 miles, and that mount *Ætna* can be represented by an equilateral triangle, each of whose sides is 30 miles, we will have an amazing elevation indeed, no less than 26 miles perpendicular!—Such a height being beyond all credibility, we must contract the sides of our triangle, in proportion to its basis. We shall begin with allowing 10 miles for the difference between a straight line from Catania to the summit, and the length of the road, occasioned by the inequalities of the mountain; and supposing the descent on the other side to be somewhat shorter, we may call it 15 miles. Mount *Ætna* will now be represented by a scalene triangle, whose base is 30 miles, its longest side 20, and its shortest 15; from which proportions we will still find its height to be betwixt eight and nine miles.—This is still incredible; and when all the various relations concerning the height of *Ætna* are compared, we hope it will not be thought presumptuous in us to give it as our opinion, that the true dimensions of this mountain are as yet unknown. The following measures are given by different authors:

Dimensions uncertain.

Height above the surface of the sea, 10,036 feet.

One hundred and eighty miles circumference at the base.—Faujus de S. Fon in his *Volcans du Vivarais*.

Height 12000 feet.—Brydone. Tour to Sicily.

Height 2,500 toises.—La Platrière, said as from *Recupero*.

Height 1950 toises.—Diameter 30 miles.—Mentelle *Geogr. comp.*

Others make its height only 2000 toises, and its superficies 300 square miles.

General appearance, &c.

Concerning the products and general appearance of this volcano, authors are much better agreed.—The journey from Catania to its summit has been lately described by three travellers, M. D'Orville, Mr Brydone, and Sir William Hamilton. All these agree, that this single mountain affords an epitome of the different climates throughout the whole world: towards the foot, it is very hot; farther up, more temperate; and grows gradually more and more cold the higher we ascend. At the very top, it is perpetually covered with snow: from thence the whole island is supplied with that article, so necessary in a hot climate, and without which the natives say Sicily could not be inhabited. So great is the demand for this commodity, that the bishop's revenues, which are considerable, arise from the sale of mount *Ætna's* snow; and he is said to draw 1000*l.* a year from one small portion lying on the north side of the mountain. Great quantities of snow and ice are like-

wise exported to Malta and Italy, making a considerable branch of commerce. On the north side of this snowy region, Mr Brydone was assured, that there are several small lakes which never thaw; and that the snow mixed with the ashes and salt of the mountain are accumulated to a vast depth. The quantity of salts contained in this mountain, he, with great probability, conjectures to be one reason of the preservation of its snows; for salt increases the coldness of snow to a surprising degree*. * See Gold,

In the middle of the snowy regions stands the great and Con-crater, or mouth of *Ætna*; from which, though contrary to the usual method of travellers, we shall begin our particular account of this mountain. Sir William Hamilton describes the crater as a little mountain, about a quarter of a mile perpendicular, and very steep, situated in the middle of a gently inclining plain, of about nine miles in circumference. It is entirely formed of stones and ashes; and, as Mr Hamilton was informed by several people of Catania, had been thrown up about 25 or 30 years before the time (1769) he visited mount *Ætna*. Before this mountain was thrown up, there was only a prodigious large chasm, or gulph, in the middle of the above-mentioned plain; and it has been remarked, that about once in 100 years the top of *Ætna* falls in; which undoubtedly must be the case at certain periods, or the mountain behaved continually to increase in height. As this little mountain, though emitting smoke from every pore, appeared solid and firm, Mr Hamilton and his companions went up to the very top. In the middle is a hollow, about two miles and a half in circumference, according to Mr Hamilton; three miles and a half, according to Mr Brydone; and three or four, according to Mr D'Orville. The inside is crufted over with salts and sulphur of different colours. It goes shelving down from the top, like an inverted cone; the depth, in Mr Hamilton's opinion, nearly corresponding to the height of the little mountain. From many places of this space issue volumes of sulphureous smoke, which being much heavier than the circumambient air, instead of ascending in it, roll down the side of the mountain, till, coming to a more dense atmosphere, it shoots off horizontally, and forms a large tract in the air, according to the direction of the wind; which, happily for our travellers, carried it exactly to the side opposite to which they were placed. In the middle of this funnel is the tremendous and unfathomable gulph, so much celebrated in all ages, both as the terror of this life, and the place of punishment in the next. From this gulph continually issue terrible and confused noises, which in eruptions are increased to such a degree as to be heard at a prodigious distance. Its diameter is probably very different at different times: for Mr Hamilton observed, by the wind clearing away the smoke from time to time, that the inverted hollow cone was contracted almost to a point; while Mr D'Orville and Mr Brydone found the opening very large. Both Mr Brydone and Mr Hamilton found the crater too hot to descend into it; but Mr D'Orville was bolder: and accordingly he and his fellow-traveller, fastened to ropes which two or three men held at a distance for fear of accidents, descended as near as possible to the brink of the gulph; but the small flames and smoke which issued from it on every side, and a greenish sulphur, and pumice-stones, quite black, which covered the margin, would not permit them to come so near as

Ætna.

* See Gold,

and Con-

Crater de-

as

as to have a full view. They only saw, distinctly in the middle, a mass of matter which rose, in the shape of a cone, to the height of above 60 feet, and which towards the base, as far as their sight could reach, might be 600 or 800. While they were observing this substance, some motion was perceived on the north side, opposite to that whereon they stood; and immediately the mountain began to send forth smoke and ashes. This eruption was preceded by a sensible increase of its internal roarings; which, however, did not continue; but after a moment's dilatation, as if to give it vent, the volcano resumed its former tranquillity; but as it was by no means proper to make a long stay in such a place, our travellers immediately returned to their attendants.

On the summit of mount Ætna, Mr Hamilton observes, that he was sensible of a difficulty in respiration from the too great subtilty of the air, independent of what arose from the sulphureous smoke of the mountain. Mr Brydone takes no notice of this; which probably arose from the air being in a more rarefied state at the time of Mr Hamilton's observation than of Mr Brydone's; the barometer, as observed by the former, standing at 18 inches and 10 lines, by the latter at 19 inches 6½ lines.

In these high regions there is generally a very violent wind, which, as all our travellers found it constantly blowing from the south, may possibly be commonly directed from that point. Here Mr Brydone's thermometer fell to 27°.

Splendor of the stars The top of Ætna being above the common region of vapours, the heavens appear with exceeding great splendor.—Mr Brydone and his company observed, as they ascended in the night, that the number of stars seemed to be infinitely increased, and the light of each of them appeared brighter than usual; the whiteness of the milky-way was like a pure flame which shot across the heavens; and, with the naked eye, they could observe clusters of stars that were invisible from below. Had Jupiter been visible, he is of opinion that some of his satellites might have been discovered with the naked eye, or at least with a very small pocket-glass. He likewise took notice of several of those meteors called *falling stars*; which appeared as much elevated as when viewed from the plain: a proof, according to Mr Brydone, that “these bodies move in regions much beyond the bounds that some philosophers have assigned to our atmosphere.”

Extensive prospect. To have a full and clear prospect from the summit of mount Ætna, it is necessary to be there before sunrise; as the vapours raised by the sun, in the day-time, will obscure every object: accordingly, our travellers took care to arrive there early enough; and all agree, that the beauty of the prospect from thence cannot be expressed.—Here Mr Brydone and Mr Hamilton had a view of Calabria in Italy, with the sea beyond it; the Lipari islands, and Stromboli, a volcano at about 70 miles distance, appeared just under their feet; the whole island of Sicily, with its rivers, towns, harbours, &c. appeared distinct, as if seen on a map. Massa, a Sicilian author, affirms, that the African coast, as well as that of Naples, with many of its islands, have been discovered from the top of Ætna. The visible horizon here is not less than 8 or 900 miles in diameter. The pyramidal shadow of the mountain reaches across the

whole island, and far into the sea on the other side, forming a visible tract in the air, which, as the sun rises above the horizon, is shortened, and at last confined to the neighbourhood of Ætna. The most beautiful part of the scene, however, in Mr Brydone's opinion, is the mountain itself, the island of Sicily, and the numerous islands lying round it. These last seem to be close to the skirts of Ætna; the distances appearing reduced to nothing.

This mountain is divided into three zones, which might properly enough be distinguished by the names of *torrid*, *temperate*, and *frigid*: they are, however, known by the names of the *Piedmontese*, or *Regione culta*, the cultivated, or fertile region; the *Sylvosa*, woody, or temperate zone; and the *Regione deserta*, the frigid, or desert zone, or region. All these are plainly distinguished from the summit. The *Regione deserta* is marked out by a circle of snow and ice, which extends on all sides to the distance of about eight miles, beginning at the foot of the crater. Greatest part of this region is smooth and even. This is immediately succeeded by the *Sylvosa*, or woody region; which forms a circle of the most beautiful green, surrounding the mountain on all sides. This region is variegated with a vast number of mountains of a conical form, thrown up by Ætna in those eruptions which burst out from its sides. Mr Hamilton counted 44 on the Catania side, each having its crater, many with large trees flourishing both within and without the crater. All these, except a few of late date, have acquired a wonderful degree of fertility. The circumference of this zone, or great circle, according to Recupero, is not less than 70 or 80 miles. It is everywhere succeeded by the *Regione culta*; which is much broader than the rest, and extends on all sides to the foot of the mountain. Here terrible devastations are sometimes committed by the eruptions; and the whole region is likewise full of conical mountains thrown up by them. The circumference of this region, is, by Recupero, reckoned 183 miles; but we have already given our reasons for rejecting these dimensions.—This region is bounded by the sea to the south and south-east; and on all other sides, by the river Semetus and Alcantara, which form the boundaries of mount Ætna.

About a mile below the foot of the great crater, are found the ruins of an ancient structure, called *Il Torre del Filosofo*, by some supposed to have been built by the philosopher Empedocles, who took up his habitation here, the better to study the nature of mount Ætna. By others they are supposed to be ruins of a temple of Vulcan. They are of brick, and seem to have been ornamented with marble. Somewhere in this region also, Mr D'Orville found a great oblong block of polished marble, eight or ten feet high, and three or four thick; though how it came there, was quite unaccountable to him. From Mr D'Orville's and Mr Brydone's accounts, we must reckon this part of the mountain pretty steep: but Mr Hamilton says, that the ascent was so gradual, as not to be in the least fatiguing; and had it not been for the snows, they might have rode on their mules to the very foot of the crater.

The woody region descends eight or nine miles below the *Regione deserta*, but differs greatly in the temperature of its climate. Mr Hamilton observed a gradual decrease of the vegetation as he advanced; the under part being covered with large timber trees, which

Ætna grew gradually less as he approached the third region, at last they degenerated into the small plants of the northern climates. He also observed quantities of juniper and tansey; and was informed by his guide, that later in the season (he visited *Ætna* in June 1769) there are a great many curious plants, and in some places rhubarb and saffron in great plenty. In Carrera's history of Catania, there is a list of all the plants and herbs of *Ætna*, in alphabetical order.

This region is extolled by Mr Brydone as one of the most delightful spots on earth. He lodged for a night in a large cave near the middle, formed by one of the most ancient lavas. It is called *La Spelonca del Capriolo*, or the goats cavern; because it is frequented by those animals, which take refuge there in bad weather. Here his rest was disturbed by a mountain thrown up in the eruption 1766. It discharged great quantities of smoke, and made several explosions like heavy cannon fired at a distance; but they could observe no appearance of fire.

This gentleman likewise visited the eastern side of the *Regione sylvestra*, intending to have ascended that way to the summit, and descended again on the south side to Catania; but found it impracticable; though what the insurmountable difficulties were, he does not mention. On this side, part of the woody region was destroyed, in 1755, by an immense torrent of boiling water, which issued from the great crater. Its traces were still very visible, about a mile and an half broad, and in some places more. The soil was then only beginning to recover its vegetative power, which it seems this torrent had destroyed for 14 years.—Near this place are some beautiful woods of cork, and evergreen oak, growing absolutely out of the lava, the soil having hardly filled the crevices; and not far off, our traveller observed seven little mountains that seemed to have been formed by a late eruption. Each of these had a regular cup, or crater, on the top; and, in some, the middle gulph, or *Voragine*, as the Sicilians call it, was still open. Into these gulphs Mr Brydone tumbled down stones, and heard the noise for a long time after. All the fields round, to a considerable distance, were covered with large burnt stones discharged from these little volcanoes.

Over-
grown
chestnut
trees.

The woody region, especially the east side, called *Carpinetto* abounds with very large chestnut-trees; the most remarkable of which has been called, from its size, *Castagno de Cento Cavalli*, or chestnut-tree of an hundred horse. Mr Brydone was greatly disappointed at the sight of this tree, as it is only a bush of five large ones growing together: but his guides assured him, that all these five were once united into one stem; and Signior Recupero told him, that he himself had been at the expence of carrying up peasants with tools to dig round this bush of trees, and found all the stems united below ground in one root. The circumference, as measured by Messrs Brydone and Glover who accompanied him, amounted to 204 feet. Another of these, about a mile and a half higher on the mountain, is called *Castagna del Galea*: it rises from one solid stem to a considerable height; after which it branches out, and is a much finer object than the other: this was measured two feet above the ground, and found to be 76 feet in circumference. A third, called *Castagna del Nave*, is pretty nearly of the same size; and Massa, one of the most

esteemed Sicilian authors, affirms that he has seen solid oaks there upwards of 40 feet round. All these grow on a thick rich soil, which seems originally to have been formed of ashes thrown out by the mountain. Here the barometer stood at 26 inches 5 lines and an half, indicating an elevation of near 4000 feet.

The Piedmontese district is covered with towns, villages, monasteries, &c. and is well peopled, notwithstanding the danger of such a situation: but the fertility of the soil tempts people to inhabit that country; and their superstitious confidence in their saints, with the propensity mankind have to despise danger which they do not see, render them as secure there as in any other place. Here, Sir William Hamilton observes, they keep their vines low, contrary to the custom of those who inhabit mount Vesuvius; and they produce a stronger wine, but not in such abundance: here also many terrible eruptions have burst forth; particularly one in 1669. At the foot of the mountain raised by that eruption, is a hole, through which Sir William Hamilton descended, by means of a rope, into several subterraneous caverns, branching out, and extending much farther than he chose to venture, the cold there being excessive, and a violent wind extinguishing some of the torches. Many other caverns are known in this and the other regions of *Ætna*; particularly one near this place called *La Spelonca della Palomba*, (from the wild pigeons building their nests there.) Here Mr Brydone was told that some people had lost their senses, from having advanced too far, imagining they saw devils and damned spirits.—Some of these caverns are made use of as magazines for snow; which they are well adapted for, on account of their extreme cold. These are with great probability supposed by Sir William Hamilton to be the hollows made by the issuing of the lava in eruptions.

In this region the river *Acis*, so much celebrated by the poets, in the fable of *Acis* and *Galatea*, takes its rise. It bursts out of the earth at once in a large stream, runs with great rapidity, and about a mile from its source throws itself into the sea. Its water is remarkably clear; and so extremely cold, that it is reckoned dangerous to drink it: it is said, however, to have a poisonous quality, from being impregnated with vitriol; in consequence of which cattle have been killed by it. It never freezes, but is said often to contract a greater degree of cold than ice.

Having thus given an account of this mountain in its quiet and peaceable state, we must now describe the appearance it puts on during the time of an eruption, when it spreads destruction for many miles round, and is capable of striking the boldest with terror.

Sir William Hamilton, who has examined both Vesuvius and *Ætna* in a very accurate manner, never had an opportunity of seeing an eruption of the latter; but as he is of opinion that the two volcanoes agree perfectly in all respects, only that the latter is on a much larger scale than the former, we hope it will not be unacceptable to our readers to give an account of some of the general appearances of Vesuvius when in a state of eruption, the better to help their ideas concerning *Ætna*.

It has been already observed, that a smoke constantly issues from the top of *Ætna*, and that its internal noise never ceases. The case is the same with Vesuvius:

Ætna. **vius:** and Sir William Hamilton observed, that in bad weather the smoke was more considerable, as well as the noises much louder, than when it was fair; so that in bad weather he had frequently heard the inward explosions of the mountain at Naples six miles distant from Vesuvius. He also observed the smoke that issued from the mountain in bad weather to be very white, moist, and not near so offensive as the sulphureous steams from various cracks in the side of the mountain.

Signs of an approaching eruption. The first symptom of an approaching eruption is an increase of the smoke in fair weather: after some time, a puff of black smoke is frequently seen to shoot up in the midst of the white, to a considerable height. These puffs are attended with considerable explosions: for

Hamilton's Observations, p. 4. while Vesuvius was in this state, Sir William Hamilton went up to its top, which was covered with snow: and perceiving a little hillock of sulphur, about six feet high, which had been lately thrown up, and burnt with a blue flame at the top, he was examining this phenomenon, when suddenly a violent report was heard, a column of black smoke shot up with violence, and was followed by a reddish flame. Immediately a shower of stones fell; upon which he thought proper to retire. Phenomena of this kind, in all probability, precede the eruptions of Ætna in a much greater degree.—The smoke at length appears wholly black in the day-time, and in the night has the appearance of flame; showers of ashes are sent forth, earthquakes are produced, the mountain discharges volleys of red-hot stones to a great height in the air. The force by which these stones are projected, as well as their magnitudes, seems to be in proportion to the bulk of the mountain. Signior Recupero assured Mr Brydone, that he had seen immensely large ones thrown perpendicularly upwards to the height of 7000 feet, as he calculated from the time they took to arrive at the earth after beginning to descend from their greatest elevation. The largest stone, or rather rock, that was ever known to be emitted by Vesuvius, was 12 feet long and 45 in circumference. This was thrown a quarter of a mile; but much larger ones have been thrown out by mount Ætna, almost in the proportion in which the latter exceeds Vesuvius in bulk. Along with these terrible symptoms, the smoke that issues from the crater is sometimes in a highly electrified state. In this case, the small ashes which are continually emitted from the crater, are attracted by the smoke, and rise with it to a great height, forming a vast black, and to appearance dense, column; from this column continual flashes of forked or zig-zag lightning issue, sometimes attended with thunder, and sometimes not, but equally powerful with ordinary lightning. This phenomenon was observed by Sir William Hamilton in the smoke of Vesuvius, and has also been taken notice of in that of Ætna; and where this electrified smoke hath spread over a tract of land, much mischief hath been done by the lightning proceeding from it.

Thunder and lightning from the smoke

When these dreadful appearances have continued sometimes four or five months, the lava begins to make its appearance. This is a stream of melted mineral matters, which in Vesuvius commonly boils over the top, but very seldom does so in Ætna; owing to the great weight of the lava, which long before it can be raised to the vast height of mount Ætna, bursts out through some weak place in its side. Upon the ap-

pearance of the lava, the violent eruptions of the mountain generally, though not always, cease; for if this burning matter gets not sufficient vent, the commotions increase to a prodigious degree.—In the night-time the lava appears like a stream of fire, accompanied with flame; but in the day-time it has no such appearance: its progress is marked by a white smoke, which by the reflection of the red-hot matter in the night assumes the appearance of flame.

All the abovementioned symptoms preceded the great Eruption of Ætna in 1669. For several months before in 1669, the lava broke forth, the *old mouth*, or great crater on the summit, was observed to send forth great quantities of smoke and flame; the top had fallen in, so that the mountain was much lowered; the islands also of Volcan and Stromboli, two volcanoes to the westward of Sicily, were observed to rage more than usual.—Eighteen days before the eruption, the sky was very thick and dark, with thunder, lightning, frequent concussions of the earth, and dreadful subterraneous bellowings. On the 11th of March, some time before the lava got vent, a rent was opened in the mountain twelve miles in length, into which, when stones were thrown down, they could not be heard to strike the bottom. Burning rocks, 60 palms (15 of our feet) in length, were thrown to the distance of a mile; others of a lesser size were carried three miles off; the internal noises of the mountain were exceedingly dreadful, and the thunder and lightning from the smoke scarce less terrible than they. When the lava at last got vent, it burst out of a vineyard, 20 miles below the great crater, and sprung up into the air to a considerable height. Here it formed a mountain of stones and ashes, not less, as Sir W^m Hamilton conjectures, than half a mile perpendicular in height, and three miles in circumference. For 54 days neither sun nor stars had appeared: but soon after the lava got vent, the mountain became very quiet. The terrible effects of this fiery stream may be imagined from its amazing extent; being, as Sir W^m Hamilton observes, no less than 14 miles long, and in many places six in breadth. In its course, it destroyed the habitations of near 30,000 persons; and meeting with a lake four miles in compass, it not only filled it up, though several fathom deep, but made a mountain in the place of it. Having reached Catania, it destroyed part of its walls, and ran for a considerable length into the sea, forming a safe and beautiful harbour; which, however, was soon filled up by a fresh torrent of the same inflamed matter.

It is not easy for those who have never been present at those terrible operations of nature, to represent to their minds the horror which must attend the breaking forth of the lava; for though the giving vent to this burning matter generally produces a cessation of the violent efforts of the internal fire, yet at the very instant of its explosion scarce any thing can be conceived so dreadful. See **VESUVIUS**.

When the lava first issues, it appears very fluid, and runs with the rapidity of a swift river; but even then it surprisingly resists the impression of solid bodies; for Sir W^m Hamilton could not pierce that of Vesuvius with a stick driven against it with all his force; nor did the largest stone he was able to throw upon it sink, but made a slight impression, and then floated along. This happened almost at the very mouth, when the lava appeared

Phenomena at the breaking forth of the lava.

Hamilton's observations, p. 10.

Ætna. ed liquid as water, and when he saw it running with a rapidity equal to the river Severn at the passage near Bristol.—A description of the lava issuing from mount Ætna in 1669 was sent to the court of England by Lord Winchelsea, who at that time happened to be at Catania in his way home from an embassy at Constantinople. His account is not now to be procured; but Mr Hamilton found a copy in Sicily, and hath given an extract, part of which follows. “When it was night, I went upon two towers in divers places; and I could plainly see, at ten miles distance, as we judged, the fire begin to run from the mountain in a direct line, the flame to ascend as high and as big as one of the greatest steeples in your Majesty’s kingdoms, and to throw up great stones into the air; I could discern the river of fire to descend the mountain of a terrible firey or red colour, and stones of a paler red to swim thereon, and to be some as big as an ordinary table. We could see this fire to move in several other places, and all the country covered with fire, ascending with great flames in many places, smoking like to a violent furnace of iron melted, making a noise with the great pieces that fell, especially those that fell into the sea. A cavalier of Malta, who lives there, and attended me, told me, that the river was as liquid, where it issues out of the mountain, as water, and came out like a torrent with great violence, and is five or six fathom deep, and as broad, and that no stones sink therein.”

Lava of
1669 de-
scribed.

The account given in the Philosophical Transactions is to the same purpose. We are there told, that the lava is “nothing else than diverse kinds of metals and minerals, rendered liquid by the fierceness of the fire in the bowels of the earth, boiling up and gushing forth as the water doth at the head of some great river; and having run in a full body for a stone’s cast or more, began to crust or curdle, becoming, when cold, those hard porous stones which the people call *Sciarri*.” Those, though cold in comparison of what first issues from the mountain, yet retained so much heat as to resemble huge cakes of sea-coal strongly ignited, and came tumbling over one another, bearing down or burning whatever was in their way.—In this manner the lava proceeded slowly on till it came to the sea, when a most extraordinary conflict ensued betwixt the two adverse elements. The noise was vastly more dreadful than the loudest thunder, being heard thro’ the whole country to an immense distance; the water seemed to retire and diminish before the lava, while clouds of vapour darkened the sun. The whole fish on the coast were destroyed, the colour of the sea itself was changed, and the transparency of its waters lost for many months.

While this lava was issuing in such prodigious quantity, the merchants, whose account is recorded in the Philosophical Transactions, attempted to go up to the mouth itself; but durst not come nearer than a furlong, lest they should have been overwhelmed by a vast pillar of ashes, which to their apprehension exceeded twice the bigness of St Paul’s steeple in London, and went up into the air to a far greater height; at the mouth itself was a continual noise, like the beating of great waves of the sea against rocks, or like distant thunder, which sometimes was so violent as to be heard 60, or even 100 miles off; to which distance also part of the ashes were carried. Some time after, having gone up,

they found the mouth from whence this terrible deluge issued to be only a hole about 10 feet diameter. This is also confirmed by Mr Brydone; and is probably the same through which Sir W^m Hamilton descended into the subterranean caverns already mentioned.

Ætna.
Diameter
of the hole
whence the
lava issued.

Mount Ætna, as we have already remarked, has been a celebrated volcano from the remotest antiquity. Diodorus Siculus mentions eruptions of it as happening 500 years before the Trojan war, or 1697 years before the Christian æra. From Homer’s silence with regard to the phenomenon of Ætna, it is to be presumed that the volcano had been many ages in a state of inactivity, and that no tradition of its burning remained among the inhabitants at the time he composed his *Odyssey*; perhaps it never had emitted flames since the country was peopled. The first eruption taken notice of by ancient, but by no means cotemporary authors, happened before the Greeks landed on the island, and is supposed to have scared the Sicani from the east part of Sicily.

Pindar, quoted above, is the oldest writer extant who speaks of Ætna as a volcano. The first recorded eruption was in the time of Pythagoras. Plato was invited by the younger Dyonisius to examine the state of the mountain after the sixth. It threw up flames and lava near an hundred times between that period and the battle of Pharsalia; it was particularly furious while Sextus Pompeius was adding the horrors of war to its devastations. Charlemagne happened to be at Catania during one of the eruptions; and from his reign the chronicles mention fifteen down to that of the year 1669, the most terrible of them all. Since 1669 there have been several eruptions, but none of them comparable to it. In that which happened in 1766, the lava sprung up into the air to a considerable height, twelve miles below the summit; but formed a stream only six miles in length and one mile in breadth.

The last eruption happened in 1787. From the 1st Account of to the 10th of July, there were signs of its approach. On the 11th, after a little calm, there was a subterranean noise, like the sound of a drum in a close place, and it was followed by a copious burst of black smoke. It was then calm till the 15th, when the same prognostics recurred. On the 17th, the subterraneous noise was heard again; the smoke was more abundant, slight shocks of an earthquake followed, and the lava flowed from behind one of the two little mountains which form the double head of Ætna. On the 18th, while the spectators were in anxious expectation of a more severe eruption, all was quiet, and continued so more than 12 hours: soon after they perceived some new shocks, accompanied with much noise; and the mountain threw out a thick smoke, which, as the wind was westerly, soon darkened the eastern horizon: two hours afterwards a shower of fine black brilliant sand descended: on the east side it was a storm of stones; and, at the foot of the mountain, a deluge of flashes of fire, of scoria and lava.

the late e-
ruption,
1787.

These appearances continued the whole day; at the setting of the sun the scene changed. A number of conical flames rose from the volcano; one on the north, another on the south, were very conspicuous, and rose and fell alternately. At three in the morning, the mountain appeared cleft, and the summit seemed a burning mass. The cones of light which arose from the crater were of an immense extent, particularly the two

just

Ætna, just mentioned. The two heads seemed to be cut away: and at their separation was a cone of flame, seemingly composed of many lesser cones. The flame seemed of the height of the mountain placed on the mountain; so that it was probably two miles high, on a base of a mile and a half in diameter. This cone was still covered with a very thick smoke, in which there appeared very brilliant flashes of lightning, a phenomenon which Ætna had not before afforded. At times, sounds like those from the explosion of a large cannon were heard seemingly at a less distance than the mountain. From the cone, as from a fountain, a jet of many flaming volcanic matters were thrown, which were carried to the distance of six or seven miles: from the base of the cone a thick smoke arose, which, for a moment, obscured some parts of the flame, at the time when the rivers of lava broke out. This beautiful appearance continued three quarters of an hour. It began the next night with more force; but continued only half an hour. In the intervals, however, Ætna continued to throw out flames, smoke, stones ignited, and showers of sand. From the 20th to the 22d, the appearances gradually ceased. The stream of lava was carried towards Bronte and the plain of Lago.

After the eruption, the top of the mountain on the western side was found covered with hardened lava, scoria, and stones. The travellers were annoyed by smoke, by showers of sand, mephitic vapours, and excessive heat. They saw that the lava which came from the western point divided into two branches, one of which was directed towards Libeccio; the other, as we have already said, towards the plain of Lago. The lava on the western head of the mountain, had from its various shapes been evidently in a state of fusion: from one of the spiracula, the odour was strongly that of liver of sulphur. The thermometer, in descending, was at 40 degrees of Fahrenheit's scale; while near the lava, in the plain of Lago, it was 140 degrees. The lava extended two miles; its width was from 13½ to 21 feet, and its depth 13½ feet.

These are the most remarkable circumstances we have been able to collect, that might serve to give an adequate idea of this famous mountain.—Many things, however, concerning the extent, antiquity, &c. of the lavas, remain to be discussed, as well as the opinions of philosophers concerning the origin of the internal fire which produces so much mischief: but the consideration of these belongs to the general article **VOLCANO**, to which the reader is referred.—The fate of *Catania* and *Hybla*, which have often been destroyed by eruptions, will be mentioned under these two words.

Ætna salt, *Sal Ætnæ*, a name given by some authors to the sal ammoniac, which is found on the surface and sides of the openings of Ætna, and other burning mountains after their eruptions; and sometimes on the surface of the ferruginous matter which they throw out. This salt makes a very various appearance in many cases; it is sometimes found in large and thick cakes, sometimes only in form of a thin powder, scattered over the surface of the earth and stones. Some of this salt is yellow, some white, and some greenish. This salt is a concrete of nitre, sulphur, and vitriol, burnt and sublimed together; Borelli found once a vast quantity of this salt on mount Ætna, and

tried many experiments on it; from whence he concluded, that this salt is so far from occasioning the explosions of that mountain, as some have supposed, that it does not exist in it, but is formed during the burning. Phil. Trans. N° 100.

ÆTOLARCHA, in Grecian antiquity, the principal magistrate or governor of the Ætolians.

AFER (Domitius), a famous orator, born at Nîmes, flourished under Tiberius and the three succeeding emperors. Quintilian makes frequent mention of him, and commends his pleadings. But he disgraced his talents, by turning informer against some of the most distinguished personages in Rome. Quintilian, in his youth, cultivated the friendship of Domitius very assiduously. He tells us that his pleadings abounded with pleasant stories, and that there were public collections of his witty sayings, some of which he quotes. He also mentions two books of his "*On Witnesses*." Domitius was once in great danger from an inscription he put upon a statue erected by him in honour of Caligula, wherein he declared that this prince was a second time a consul at the age of 27. This he intended as an encomium, but Caligula taking it as a sarcasm upon his youth, and his infringement of the laws, raised a process against him, and pleaded himself in person. Domitius, instead of making a defence, repeated part of the emperor's speech with the highest marks of admiration; after which he fell upon his knees, and, begging pardon, declared, that he dreaded more the eloquence of Caligula than his imperial power. This piece of flattery succeeded so well, that the emperor not only pardoned, but also raised him to the consulship. Afer died in the reign of Nero, A. D. 59.

AFFA, a weight used on the Gold Coast of Guinea. It is equal to an ounce, and the half of it is called *eggeba*. Most of the blacks on the Gold Coast give these names to those weights.

AFFECTION, in a general sense, implies an attribute inseparable from its subject. Thus magnitude, figure, weight, &c. are affections of all bodies; and love, fear, hatred, &c. are affections of the mind *. *See Moral

AFFECTION, signifying a settled bent of mind toward Philosophy, a particular being or thing, occupies a middle space Part I. sec. between disposition on the one hand, and passion on the other †. It is distinguishable from Disposition, which being a branch of one's nature, originally, must exist before there can be an opportunity to exert it upon any particular object; whereas Affection can never be original, because, having a special relation to a particular object, it cannot exist till the object have once at least been presented. It is also distinguishable from Passion, which, depending on the real or ideal presence of its object, vanishes with its object: whereas Affection is a lasting connection; and, like other connections, subsists even when we do not think of the person. A familiar example will illustrate this. There may be in one person's mind a disposition to gratitude, which, through want of an object, happens never to be exerted; and which therefore is never discovered even by the person himself. Another, who has the same disposition, meets with a kindly office that makes him grateful to his benefactor: An intimate connection is formed between them, termed *affection*: which, like other connections, has a permanent existence, though not always in view. The af-

Ætolarcha
Affection.

Affection, affection, for the most part, lies dormant, till an opportunity offer for exerting it: in that circumstance, it is converted into passion of gratitude; and the opportunity is eagerly seized of testifying gratitude in the warmest manner.

AFFECTION, among physicians, signifies the same as disease. Thus the hysteric *affection* is the same with the hysteric disease.

AFFERERS, or **AFFERORS**, in law, persons appointed in court-leets, courts-baron, &c. to settle, upon oath, the fines to be imposed upon those who have been guilty of faults arbitrarily punishable.

AFFETUOSO, or *Con Affetto*, in the Italian music, intimates that the part to which it is added ought to be played in a tender moving way, and consequently rather slow than fast.

AFFIANCE, in law, denotes the mutual plighting of troth between a man and woman to marry each other.

AFFIDAVIT, signifies an oath in writing, sworn before some person who is authorised to take the same.

AFFINITY, among civilians, implies a relation contracted by marriage; in contradistinction to consanguinity, or relation by blood.—Affinity does not found any real kinship; it is no more than a kind of fiction, introduced on account of the close relation between husband and wife. It is even said to cease when the cause of it ceases: hence a woman who is not capable of being a witness for her husband's brother during his lifetime, is allowed for a witness when a widow, by reason the affinity is dissolved. Yet with regard to the contracting marriage, affinity is not dissolved by death, though it be in every thing else.

There are several degrees of affinity, wherein marriage was prohibited by the law of Moses: thus, the son could not marry his mother, nor his father's wife (Lev. xviii. 7. et seq.): the brother could not marry his sister, whether she were so by the father only or by the mother only, and much less if she was his sister both by the same father and mother: the grandfather could not marry his grand-daughter, either by his son or daughter. No one could marry the daughter of his father's wife; nor the sister of his father or mother. Nor the uncle his niece; nor the aunt her nephew. Nor the nephew the wife of his uncle by the father's side. The father-in-law could not marry his daughter-in-law: nor the brother the wife of his brother, while living; nor even after the death of his brother, if he left children. If he left no children, the surviving brother was to raise up children to his deceased brother, by marrying his widow. It was forbidden to marry the mother and the daughter at one time, or the daughter of the mother's son, or the daughter of her daughter, or two sisters together. It is true the patriarchs before the law married their sisters, as Abraham married Sarah, who was his father's daughter by another mother; and two sisters together, as Jacob married Rachel and Leah; and their own sisters by both father and mother, as Seth and Cain. But these cases are not to be proposed as examples: because in some they were authorised by necessity; in others by custom; and the law as yet was not in being. If some other examples may be found, either before or since the law, the scripture expressly disapproves of them, as Reuben's incest with Balah his father's concubine, and the action of Ammon with his sister Tamar; and that of Herod-Antipas, who married Herodias his sister-in-law, his brother Philip's wife, while her husband was yet living.

Affinity, Affinity.

AFFINITY is also used to denote conformity or agreement: Thus we say, the affinity of languages, the affinity of words, the affinity of sounds, &c.

AFFINITY, or **ELECTIVE ATTRACTION**, are terms used by modern chemists to express that peculiar propensity which different species of matter have to unite and combine with certain other bodies exclusively, or in preference to any other connection.

AFFIRMATION, in logic, the asserting the truth of any proposition.

AFFIRMATION, in law, denotes an indulgence allowed to the people called *Quakers*: who, in cases where an oath is required from others, may make a solemn affirmation that what they say is true; and if they make a false affirmation, they are subject to the penalties of perjury. But this relates only to oaths taken to the government, and on civil occasions; for Quakers are not permitted to give their testimony in any criminal case, &c.

AFFIRMATION is also used for the ratifying or confirming the sentence or decree of some inferior court: Thus we say, the house of lords affirmed the decree of the lord chancellor, or the decree of the lords of session.

AFFIRMATIVE, in grammar. Authors distinguish affirmative particles; such is, *yes*.—The term *affirmative* is sometimes also used substantively. Thus we say, the affirmative is the more probable side of the question: there were so many votes, or voices, for the affirmative.

AFFIX, in grammar, a particle added at the close of a word, either to diversify its form or alter its signification. We meet with *affixes* in the Saxon, the German, and other northern languages; but more especially in the Hebrew, and other oriental tongues. The Hebrew *affixes* are single syllables, frequently single letters, subjoined to nouns and verbs; and contribute not a little to the brevity of that language. The oriental languages are much the same as to the *radicals*, and differ chiefly from each other as to *affixes* and *prefixes*.

AFFLATUS, literally denotes a blast of wind, breath, or vapour, striking with force against another body. The word is Latin, formed from *ad* "to," and *flare* "to blow." Naturalists sometimes speak of the *afflatus* of serpents. Tully uses the word figuratively, for a divine inspiration; in which sense, he ascribes all great and eminent accomplishments to a divine *afflatus*. The Pythian priestess being placed on a tripod or perforated stool, over a holy cave, received the divine *afflatus*, as a late author expresses it, in her belly; and being thus inspired, fell into agitations, like a phrenetic; during which she pronounced, in hollow groans and broken sentences, the will of the deity. This *afflatus* is supposed, by some, to have been a subterraneous fume, or exhalation, wherewith the priestess was literally inspired. Accordingly, it had the effects of a real physical disease; the paroxysm of which was so vehement, that Plutarch observes it sometimes proved mortal. Van Dale supposes the pretended enthusiasm of the Pythia to have arisen from the fumes of aromatics.

AFFLICTION, is not itself, in propriety of medical

Afforage, cal speech, a disease, but it produces many: for whatever excites envy, anger, or hatred, produces diseases from tense fibres; as whatever excites fear, grief, joy, or delight, begets diseases from relaxation.

Africa.

AFFORAGE, in the French customs, a duty paid to the lord of a district, for permission to sell wine, or other liquors, within his seignory. Afforage is also used for the rate or price of provisions laid and fixed by the provost or sheriffs of Paris.

AFFORESTING, **AFFORESTATIO**, the turning ground into forest. The Conqueror, and his successors, continued afforesting the lands of the subject for many reigns; till the grievance became so notorious, that the people of all degrees and denominations were brought to sue for relief; which was at length obtained, and commissions were granted to survey and perambulate the forest, and separate all the new afforested lands, and re-convert them to the uses of their proprietors, under the name and quality of *purieu* or *pouralle land*.

AFFRAY, or **AFFRAYMENT**, in law, formerly signified the crime of affrighting other persons, by appearing in unusual armour, brandishing a weapon, &c. but, at present, *affray* denotes a skirmish or fight between two or more.

AFFRONTÉE, in heraldry, an appellation given to animals facing one another on an escutcheon; a kind of bearing which is otherwise called *confrontée* and stands opposed to *adossée*.

AFFUSION, the act of pouring some fluid substance on another body. Dr Grew gives several experiments of the luctation arising from the affusion of divers menstruums on all sorts of bodies. Divines and church historians speak of baptism by affusion; which amounts to much the same with what we now call *sprinkling*.

AFRANIUS, a Latin poet, who wrote comedies in imitation of Menander, commended by Tully and Quintilian: he lived in the 170th olympiad.

AFRICA (according to Bochart, from a Punic word, signifying *Ears of Corn*); one of the four great divisions, by the moderns called *quarters*, of the world, and one of the three called by the Greeks *ἡμέραι*, or *continents*. By them it was also called *Libya*.

Africa lies south of Europe, and west of Asia. It is bounded on the north by the Mediterranean, which separates it from the former: on the north-east, by the Red Sea, which divides it from Asia, and to which it is attached by a neck of land called the *Isthmus of Suez*, about 60 miles over, separating the Mediterranean from the Red Sea. On the west, south, and east, it is bounded by the main ocean: so that it is properly a vast peninsula, bearing some faint resemblance of a pyramid, the base of which is the northern part, running along the shores of the Mediterranean; and the top of the pyramid is the most southerly point, called the *Cape of Good Hope*. Its greatest length from north to south is 4300 miles, and its greatest breadth from east to west is 3500 miles; reaching from Lat. 37° N. to 35° S. and from Long. 170° W. to 50° E.

Though the greatest part of this continent hath been in all ages unknown both to the Europeans and Asiatics, its situation is more favourable than either Europe or Asia for maintaining an intercourse with other nations. It stands, as it were, in the centre of the three

other quarters of the globe; and has thereby a much nearer communication with Europe, Asia, and America, than any one of these has with another. For, (1.) It is opposite to Europe in the Mediterranean, for almost 1000 miles in a line from east to west; the distance seldom 100 miles, never 100 leagues, and sometimes not above 20 leagues. (2.) It is opposite to Asia for all the length of the Red Sea, the distance sometimes not exceeding five leagues, seldom fifty. (3.) Its coast for the length of about 2000 miles lies opposite to America at the distance of from 500 to 700 leagues, including the islands: whereas America, unless where it may be a *terra incognita*, is no where nearer Europe than 1000 leagues; and Asia, than 2500.

As the equator divides this continent almost in the middle, the far greatest part of it is within the tropics; and of consequence the heat in some places is almost insupportable by Europeans, it being there greatly increased by vast deserts of burning sand.—It cannot be doubted, however, that, were the country well cultivated, it would be extremely fertile; and would produce in great abundance, not only the necessaries, but also the luxuries, of life. It has been asserted, that the sugars of Barbadoes and Jamaica, as also the ginger, cotton, rice, pepper, pimento, cocoa, indigo, &c. of these islands, would thrive in Africa to as much perfection as where they are now produced. Nor can it be doubted, that the East Indian spices, the tea of China and Japan, the coffee of Mocha, &c. would all thrive in some parts of the African coast; as this continent has the advantage of feeling no cold, the climate being either very warm or very temperate.

Whatever may be the case with the internal parts of Africa, it is certain that its coasts are well watered with many very considerable rivers. The Nile and the Niger may be reckoned among the largest in any part of the world, America excepted. The first discharges itself into the Mediterranean, after a prodigious course from its source in Abyssinia. The origin neither of the Nile, nor of the Niger, is certainly known; but that of the latter is supposed to run through a tract of land little less than 3000 miles. Both these rivers annually overflow their banks, fertilizing by that means the countries through which they pass. The Gambia and Senegal rivers are only branches of the Niger. Many vast ridges of mountains also run through different parts of this continent; but their extent is very little known. Some of the most remarkable are, (1.) Those called *Atlas*, lying between the 20th and 25th degree of north latitude, and supposed almost to divide the continent from east to west. (2.) The *mountains of the moon*, so called on account of their great height; supposed to be the boundaries between Abyssinia and some of the interior kingdoms. (3.) The mountains of *Sierra Leona*, so called on account of their abounding with lions, and likewise supposed to be the boundaries of some of the nations. (4.) Those called by the ancients the *mountains of God*, on account of their being subject to perpetual thunder and lightning. Of all these, however, little more is known than their names.

To what we have already said concerning the produce of Africa, we may add, that no part of the world abounds with gold and silver in a greater degree. Here also are a prodigious number of elephants; and it is surprising, that neither the ancient nor modern Euro-

Ff

peans,

Africa. peans, notwithstanding their extravagant and insatiable thirst after gold and silver, should have endeavoured to establish themselves effectually in a country much nearer to them than either America or the East Indies; and where the objects of their desire are found in equal, if not greater, plenty.

Next to gold and silver, copper is the most valuable metal; and on this continent is found in great plenty, inasmuch that the mountains of Atlas above mentioned are said all to be composed of copper ore. In short, Africa, though a full quarter of the globe, stored with an inexhaustible treasure, and capable of producing almost every necessary, convenience, and luxury of life, within itself, seems to be utterly neglected both by its own inhabitants and all other nations: the former, being in a savage state, are incapable of enjoying the blessings offered them by nature; and the latter taking no farther notice of the inhabitants, or their land, than to obtain at the easiest rate what they procure with as little trouble as possible, or to carry them off for slaves to their plantations in America.

Only a small part of this continent was known to the ancients, viz. the kingdom of Egypt, and the northern coast, comprehending little more than what is now known by the name of *Barbary*. It was divided into *Africa Propria*, and *Africa Interior*. *Africa Propria* comprehended only the Carthaginian territories. *Africa Interior* comprehended all other nations to the southward of these territories, or those at a greater distance from Rome. The only kingdoms, however, with which the Romans had any connection, were the Numidians, the Mauritians, and the Gætuli. All these, as well as Egypt, were swallowed up by that enormous power, and reduced to the condition of Roman provinces. But the Romans never seem to have penetrated beyond the tropic of cancer. There appears, indeed, to have been some intercourse between them and the Ethiopians: but the latter always preserved their liberty; and we find their queen Candace mentioned in the times of the apostles, when the Roman power was at its highest pitch.

Between the tropic of cancer and the equinoctial line, a multitude of savage nations were supposed to have their residence, known by the names of Melanogætuli, Nigritæ, Blemmyes, Dolopes, Astacuri, Lotophagi, Ichthyophagi, Elephantophagi, &c. (which are taken notice of, as well as the others already mentioned, under their proper names); but that Africa was a peninsula, seems to have been totally unknown both to the Europeans and Asiatics for many ages.—It is probable indeed, that some of the Phenicians, and their offspring the Carthaginians, were not so ignorant; as they carried navigation to a much greater height than either the Greeks or Romans: but their discoveries were all concealed with the greatest care, lest other nations should reap the benefit of them; and accordingly we can now find no authentic accounts concerning them. The navigation round Africa, in particular, is recorded by the Greek and Roman writers rather as a strange amusing tale than as a real transaction; and as neither the progress of the Phenician and Carthaginian discoveries, nor the extent of their navigation, were communicated to the rest of mankind, all memorials of their extraordinary skill in naval affairs seem in a great measure to have perished, when the maritime power of

the former was annihilated by Alexander's conquest of Tyre, and the empire of the latter was overturned by the Romans. *Africa.*

That the peninsula of Africa, however, was in reality sailed round by the Phenicians, we have on indisputable authority; for some of that nation undertook the voyage, at the command of Necho king of Egypt, about 604 years before the Christian era. They sailed from a port in the Red-sea, and after three years returned by the Mediterranean: and the very objections that were made to the veracity of their accounts at that time, are unanswerable proofs to us that this voyage was really accomplished. They pretended, that, having sailed for some time, the sun became more and more vertical, after which he appeared in the north, and seemed to recede from them: that as they returned, the sun gradually seemed to move southwards; and, after becoming vertical once more, appeared then in the south side of them as before they set out. This, which we know must certainly have been the case, was deemed incredible at that time, and universal ignorance concerning the extent of this continent prevailed till the 15th century. The first attempts towards attaining a knowledge of Africa was made by the Portuguese in 1412. Notwithstanding their vicinity, they had never ventured beyond Cape *Non*, situated in about N. lat. 27°: it had received its name from a supposed impossibility of passing it. This year they proceeded 160 miles farther, to Cape Bojador; which stretching a considerable way into the Atlantic ocean, with rocky cliffs, appeared so dreadful to the navigators, that they returned without any attempt to pass it. In an attempt to double this formidable cape, they discovered the Madeira islands in 1419: but Cape Bojador continued to be the boundary of their continental discoveries till 1433; when they penetrated within the tropics, and in a few years discovered the river Senegal, Cape de Verd, and the islands which lie off that promontory. In 1449, the western islands, called the *Azores*, were discovered: and in 1471, they first penetrated beyond the line; and were surprised to find, that the torrid zone, contrary to the opinion of the ancients, who imagined it to be burnt up with heat, was not only habitable, but fertile and populous. In 1484, they proceeded 1500 miles beyond the line; so that they began to entertain hopes of finding that way a passage to the East Indies: and two years afterwards, the Cape of Good Hope was discovered by Bartholomew de Diaz; but it was not till the year 1497, that the Portuguese, under Vasquez de Gama, actually doubled this cape, and discovered the true shape of the continent. Thus the coasts of Africa were made perfectly known; and probably the knowledge concerning its interior parts would have been much greater than it is, had not the general attention been called off from this continent by the discovery of America in 1492.

The Romans for a long time maintained their power in Africa: but in the year 426, Bonifacius, supreme governor of all the Roman dominions in this quarter, being compelled to revolt by the treachery of another general called *Actius*, and finding himself unable to contend with the whole strength of the Roman empire, called in Genseric king of the Vandals to his aid; who thereupon abandoned the provinces he had seized in Europe, and passed over into Africa. Bonifacius, however,

Africa. however, being soon after reconciled to his empress, Placidia, endeavoured in vain to persuade the Vandals to retire. Hereupon a war ensued, in which the barbarians proved victorious, and quickly over-ran all the Roman provinces in Africa. In the year 435, a peace was concluded; when Numidia and some other countries were ceded to the Vandals, who soon after seized all the rest. These barbarians did not long enjoy their ill-gotten possessions: for, about the year 533, Belisarius drove them out, annexing the provinces to the eastern empire; and in 647, the Saracens, having conquered Mesopotamia, Egypt (which anciently was not included in the meaning of the word *Africa*), Phenicia, Arabia, and Palestine, broke like a torrent into Africa, which they quickly subdued. Their vast empire being in 936 divided into seven kingdoms, the African states retained their independency long after the others were subdued by the Turks: but in the beginning of the 16th century, being afraid of falling under the yoke of Spain, they invited the Turks to their assistance; who first protected, and then enslaved, them. They still continue in a kind of dependence on the Ottoman empire. They are not, however, properly speaking, the *subjects* of the Grand Signior, but call him their *protector*, paying him an annual tribute. On the coasts, the natives are almost all addicted to piracy; and with such success have they carried on their employment, that the greatest powers in Europe are become their tributaries, in order to procure liberty to trade on the Mediterranean.

Concerning even those states which are nearest to Europe, very little is known: but the interior nations are scarce known by name; nor do almost any two of the most learned moderns agree in their division of Africa into kingdoms; and the reason is, that scarcely any traveller hath ever penetrated into these inhospitable regions. According to the best accounts, concerning those regions of Africa lying beyond Egypt and Barbary, they are divided in the following manner. On the western coast, to the south of Barbary, lie the kingdoms of Bildulgerid, Zaara, Negroland, Loango, Congo, Angola, Benguela, and Terra de Natal. On the eastern coast beyond Egypt, are those of Nubia, Adel, Ajan, Zanguebar (between these two a huge desert is interposed), Monomatapa, and Sofola. In the interior parts the kingdoms of Lower Ethiopia, Abex, Monemuge, and Matanan, are made mention of. The southernmost part, called Caffraria, is well known for the habitation of the Hotentots.

In many material circumstances, the inhabitants of this extensive continent agree with each other. If we except the people of Abyssinia, who are tawny, and profess a mixture of Christianity, Judaism, and Paganism, they are all of a black complexion. In their religion, except on the sea-coasts, which have been visited and settled by strangers, they are Pagans; and the form of government is every where monarchical. Few princes, however, possess a very extensive jurisdiction; for as the natives of this part of Africa are grossly ignorant in all the arts of utility or refinement, they are little acquainted with one another; and generally united in small societies, each governed by its own prince. In Abyssinia, indeed, as well as in Congo, Loango, and Angola, we are told of powerful monarchs; but on examination, it is found that the au-

thority of these princes stands on a precarious footing, each tribe or separate body of their subjects being under the influence of a petty chieftain of their own, styled *Negus*, to whose commands, however contrary to those of the Negascha Negascht, or king of kings, they are always ready to submit.

The fertility of a country so prodigiously extensive, might be supposed more various than we find it is: in fact, there is no medium in this part of Africa with regard to the advantages of soil; it is either perfectly barren or extremely fertile. This arises from the intense heat of the sun; which, where it meets with sufficient moisture, produces the utmost luxuriance; and in those countries where there are few rivers, reduces the surface of the earth to a barren sand. Of this sort are the countries of Anian and Zaara; which, for want of water, and consequently of all other necessities, are reduced to perfect deserts, as the name of the latter denotes. In those countries, on the other hand, where there is plenty of water, and particularly where the rivers overflow the land part of the year, as in Abyssinia, the productions of nature, both of the animal and vegetable kinds, are found in the highest perfection and greatest abundance. The countries of Mandingo, Ethiopia, Congo, Angola, Batua, Truticui, Monomotapa, Casati, and Mehenemugi, are extremely rich in gold and silver. The baser metals, likewise, are found in these and many other parts of Africa. But the persons of the natives make the most considerable article in the produce and traffic of this miserable quarter of the globe.

On the Guinea or western coast, the English trade to James Fort, and other settlements near and up the river Gambia; where they exchange their woollen and linen manufactures, their hardware, and spirituous liquors, for the persons of the natives. By the treaty of peace in 1783, the river of Senegal, with its dependencies, were given up to France. Gold and ivory, next to the slave trade, form the principal branches of African commerce. These are carried on from the same coast, where the Dutch and French, as well as English, have their settlements for this purpose.

The Portuguese are in possession of the east and west coast of Africa, from the Tropic of Capricorn to the Equator; which immense tract they became masters of by their successive attempts and happy discovery and navigation of the Cape of Good Hope. From the coast of Zanguebar, on the eastern side, they trade not only for the articles abovementioned, but likewise for several others; as sena, aloes, civet, ambergris, and frankincense. The Dutch have settlements towards the southern part of the continent, in the country called Caffraria, or the land of the Hotentots, particularly Cape Town, which is well settled and fortified; where their ships bound for India usually put in, and trade with the natives for their cattle, in exchange for which they give them spirituous liquors.

The Portuguese being sovereigns of the greatest part of the coast, have a number of black princes their tributaries. There are some independent princes who have extensive dominions; particularly the kings of Dahome and Widah, the most noted of any for the infamous slave trade. Upwards of 200 years have the European nations traded with Africa in human flesh; and encouraged in the Negro countries, wars, rapine,

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desolation, and murder, that the West India islands might be supplied with that commodity. The annual exportation of poor creatures from Africa for slaves hath exceeded 100,000; numbers of whom are driven down like sheep, perhaps a 1000 miles from the sea-coast, who are generally inhabitants of villages that have been surrounded in the night by armed force, and carried off to be sold to our traders.—Nor do our planters, who purchase them, use any pains to instruct them in religion, to make them amends for the oppression thus exercised on them. It is said they are unnaturally averse to every thing that tends to it; yet the Portuguese, French, and Spaniards, in their settlements, succeed in their attempts to instruct them, as much to the advantage of the commerce as of religion. It is for the sake of Christianity, and the advantages accompanying it, that English slaves embrace every occasion of deserting to the settlements of these nations.—But upon this subject the feelings and reflection of the nation have of late been abundantly roused, and in the investigation of it the wisdom of the legislature is soon to be employed.

AFRICAN COMPANY, a society of merchants, established by King Charles II. for trading to Africa; which trade is now laid open to all his Majesty's subjects, paying 10 per cent. for maintaining the forts.

AFRICANUS (Julius), an excellent historian of the third century, the author of a chronicle which was greatly esteemed, and in which he reckons 5500 years from the creation of the world to Julius Cæsar. This work, of which we have now no more than what is to be found in Eusebius, ended at the 221st year of the vulgar æra. Africanus also wrote a letter to Origen on the history of Susanna, which he reckoned supposititious; and we have still a letter of his to Aristides, in which he reconciles the seeming contradictions in the two genealogies of Christ recorded by St Matthew and St Luke.

AFSLAGERS, persons appointed by the burgo-masters of Amsterdam to preside over the public sales made in that city. They must always have a clerk of the secretary's office with them, to take an account of the sale. They correspond to our brokers, or auctioneers.

AFT, in the sea language, the same with ABAFT.

AFTERBIRTH, in midwifery, signifies the membranes which surround the infant in the womb, generally called the secundines. See MIDWIFERY.

AFTERMATH, in husbandry, signifies the grass which springs or grows up after mowing.

AFTERNOON, the latter half of the artificial day, or that space between noon and night.

AFTER-PAINS, in midwifery, excessive pains felt in the groin, loins, &c. after the woman is delivered.

AFTER SWARMS, in the management of bees, are those which leave the hive some time after the first has swarmed. See BEE.

AFWESTAD, a large copper-work belonging to the crown of Sweden, which lies on the Dala, in the province of Dalecarlia, in Sweden. It looks like a town, and has its own church. Here they make copper-plates; and have a mint for small silver coin, as well as a royal post-house. W. Long. 14. 10. N. Lat. 58. 10.

AGA, in the Turkish language, signifies a great lord or commander. Hence the aga of the Janissaries is

the commander in chief of that corps; as the general of horse is denominated *spahiclar aga*. The aga of the Janissaries is an officer of great importance. He is the only person who is allowed to appear before the Grand Signior without his arms across his breast in the posture of a slave. Eunuchs at Constantinople are in possession of most of the principal posts of the seraglio. The title *aga* is given to them all, whether in employment or out. This title is also given to all such men without employ, and especially to wealthy landholders.

We find also *agas* in other countries. The chief officers under the Khan of Tartary are called by this name. And among the Algerines, we read of *agas* chosen from among the *beluk bashis* (the first rank of military officers), and sent to govern in the chief towns and garrisons of that state. The *aga* of Algiers is the president of the divan, or senate. For some years, the *aga* was the supreme officer; and governed the state in the place of bashaw, whose power dwindled to a shadow. But the soldiery rising against the *beluk bashis*, or *agas*, massacred most of them, and transferred the sovereign power to the calif, with the title of *Dey* or King.

AGADES, a kingdom and city of Negroland in Africa. It lies nearly under the tropic of Cancer, between Gubur and Cano. The town stands on a river that falls into the Niger; it is walled, and the king's palace is in the midst of it. The king has a retinue, who serve as a guard. The inhabitants are not so black as other negroes, and consist of merchants and artificers. Those that inhabit the fields are shepherds or herdsmen, whose cottages are made of boughs, and are carried about from place to place on the back of oxen. They are fixed on the spot of ground where they intend to feed their cattle. The houses in the city are stately, and built after the Barbary fashion. This kingdom was, and may be still, tributary to the king of Tombut. It is well watered; and there is great plenty of grass, cattle, fenna, and manna. The prevailing religion is the Mahometan, but very loosely professed. N. Lat. 26. 10. E. Long. 9. 10.

AGALLOCHUM. See XYLO ALOES.

AGALMATA, in antiquity, a term originally used to signify any kind of ornaments in a temple; but afterwards for the statutes only, as being most conspicuous.

AGAMEMNON, the son of Atreus by Erope, was captain-general of the Trojan expedition. It was foretold to him by Cassandra, that his wife Clytemnestra would be his death: yet he returned to her; and accordingly was slain by Ægisthus, who had gained upon his wife in his absence, and by her means got the government into his own hands.

AGANIPPIDES, in ancient poetry, a designation given to the muses, from a fountain of mount Helicon, called *Aganippe*.

AGANIPPE, in antiquity, a fountain of Bœotia at mount Helicon, on the borders between Phocis and Bœotia, sacred to the muses, and running into the river Permesseus; (Pliny, Pausanias.) Ovid seems to make *Aganippe* and *Hippocrene* the same. Solinus more truly distinguishes them, and ascribes the blending them to poetical license.

AGAPE, in ecclesiastical history, the love-feast, or feast of charity, in use among the primitive Christians; when

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Agapetæ, when a liberal contribution was made by the rich to feed the poor. The word is Greek, and signifies *love*. **Agard**. St Chrysostom gives the following account of this feast, which he derives from the apostolical practice. He says, "The first Christians had all things in common, as we read in the Acts of the Apostles; but when that equality of possessions ceased, as it did even in the Apostles time, the agape, or love-feast, was substituted in the room of it. Upon certain days, after partaking of the Lord's supper, they met at a common feast; the rich bringing provisions, and the poor who had nothing being invited." It was always attended with receiving the holy sacrament; but there is some difference between the ancient and modern interpreters as to the circumstance of time, viz. Whether this feast was held before or after the communion. St Chrysostom is of the latter opinion; the learned Dr Cave of the former.—These love-feasts, during the three first centuries, were held in the church without scandal or offence; but, in after times, the heathens began to tax them with impurity. This gave occasion to a reformation of these *agapæ*. The kiss of charity, with which the ceremony used to end, was no longer given between different sexes; and it was expressly forbidden to have any beds or couches, for the conveniency of those who should be disposed to eat more at their ease. Notwithstanding these precautions, the abuses committed in them became so notorious, that the holding of them (in churches at least) was solemnly condemned, at the council of Carthage, in the year 397.

AGAPETÆ, in ecclesiastical history, a name given to certain virgins and widows, who, in the ancient church, associated themselves with, and attended on, ecclesiastics, out of a motive of piety and charity.

In the primitive days there were women instituted **DEACONESSES**; who, devoting themselves to the service of the church, took up their abode with the ministers, and assisted them in their functions. In the fervour of the primitive piety, there was nothing scandalous in these societies; but they afterwards degenerated into libertinism; inasmuch, that St Jerom asks, with indignation, *unde agapetarum pestis in ecclesias introit?* This gave occasion to councils to suppress them.—St Athanasius mentions a priest, named Leontius, who, to remove all occasion of suspicion, offered to mutilate himself, to preserve his beloved companion.

AGARD (Arthur), a learned English antiquarian, born at Toston in Derbyshire in the year 1540. His fondness for English antiquities induced him to make many large collections; and his office as deputy chamberlain of the exchequer, which he held 45 years, gave him great opportunities of acquiring skill in that study. Similarity of taste brought him acquainted with Sir Robert Cotton, and other learned men, who associated themselves under the name of *The Society of Antiquarians*, of which society Mr Agard was a conspicuous member. He made the doomsday-book his peculiar study; and composed a work purposely to explain it, under the title of *Tractatus de usu et obscurioribus verbis libride Domesday*; he also compiled a book for the service of his successors in office, which he deposited with the officers of the king's receipt, as a proper index for succeeding officers. All the rest of his collections, containing at least twenty volumes, he bequeathed to Sir Robert Cotton; and died in 1615.

AGARIC. See **AGARICUS**.

Female AGARIC. See **BOLETUS**.

Mineral AGARIC, a marley earth, resembling the vegetable of that name in colour and texture. It is found in the fissures of rocks, and on the roofs of caverns; and is sometimes used as an astringent in fluxes, hemorrhagies, &c.

AGARICUS, or **MUSHROOM**, a genus of the order of fungi, belonging to the cryptogamia class of plants.

Species and uses. Botanical writers enumerate 55 species belonging to this genus; of which the most remarkable are the following.

1. The *campestris*, or common mushroom, has the top or cap first of a dirty cream colour, convex, and if but just expanding, the under part, or what is called the *gills*, is of a bright flesh red: this colour lasts but a little time before it turns darker; and when the plant is old, or has been some time expanded, the gills become of a dark brown, the cap almost flat, of a dirty colour, and often a little scaly. It differs much in size in different plants, it being from an inch to seven inches broad. The general use of it is well known. It is found in woods, old pastures, and by road-sides; and is in the greatest perfection in September. There is a variety of this with a yellowish white cap and white gills; this is very firm, but seldom expands so freely as the true sort, and when broiled will exude a yellowish juice. It is probable this sort is not pernicious, though it is always rejected by such as can distinguish it.

2. The *pratensis*, or *champignon*, is very common upon heaths and dry pastures. A number of them generally come up in a place, ranged in curved lines or circles. The cap is small, almost flat, from one to two or three inches diameter, of a pale buff colour, often crimped at the edges, and, when dry, tough like leather or a thin piece of fine cork. The gills are of the colour of the cap; are thinly placed; with a short one, and sometimes two, coming from the edge of the cap between each. The stalk or pillar is also of the colour of the cap; it is long, slender, and all the way of a thickness. This plant has but little smell; is rather dry; and yet, when broiled, or stewed, it communicates a good flavour. In perfection at the same time with the former.

3. The *chantarellus*, or *chantarelle agaric*, is rather a smaller fungus than the former. The cap is yellow, of different hues in different plants, some being of a pale yellow, and others of an orange colour. It is generally sunk in the middle, somewhat resembling a tunnel, and its edges are often twisted and contorted so as to form sinules or angles. The gills are of a deeper colour than the outside, are very fine, even, numerous and beautifully branched. The ramifications begin at the stalk, and are variously extended towards the edge of the cap. The pillar is of the same colour as the cap, is seldom inserted in the centre, but rather sideways; it is short, thickish at the root, and the gills mostly run down the top, which make it appear smallest in the middle. This plant broiled with salt and pepper has much the flavour of a roasted cockle; and is esteemed a delicacy by the French, as is the former. It is found in woods and high pastures, and is in perfection about the end of September.

4. The *deliciosus*, or orange agaric. The general size

Agaric.
Agaricus.

Agaricus. size of the cap of this species is from two to four inches broad. Its form is circular, with the edges bent inwards; convex on the upper surface, except in the centre, where it is a little depressed, so as nearly to resemble the apex of a smooth apple. The colour is a sordid yellow, streaked with ash and yellowish brown, from the centre to the edge, and when it is broken it emits a gold-colour juice. The gills are of a deep yellow, and a few of them come out by pairs at the stalk, but divide immediately, and run straight to the edge of the cap. The stalk or pillar is thinnest near the middle, thickest at the root, and when cut transversely, it is quite white in the centre, with a fine yellow ring that goes to the edge. This fungus, well seasoned and then broiled, has the exact flavour of a roasted muscle. Its prime time is September, and it is to be found in high dry woods.

5. The cinnamomeus, or brown mushroom, has a cap the colour of fresh-tanned hides. At first it is hemispherical, firm, even, and fleshy, with mostly a small rising in the centre; but when old it is quite flat. The gills are of a yellowish brown, not very distant from each other, bent like a knee at the pillar, and have a short one or two run from the edge of the cap between each. The pillar is near the length of a finger, firm, rather thick, brown at the base, of a sordid yellow upward, and, when cut transversely, of a fine white grain. The cap in different plants is from two to five inches broad. The whole plant has a pleasant smell, and when broiled gives a good flavour. It is found in woods in September and October.

6. The violaceus, or violet mushroom. Its cap, when first expanded, is smooth, hemispherical, the main surface of a livid colour, but towards the margin it is of a better blue. When full grown or old, it becomes corrugated, and of a rusty brown. The gills of a young plant are of a beautiful violet colour, and regularly placed. The pillar is of the colour of the gills, short, of a conical form, but swelled at the base into a sort of bulb. Its upper part is surrounded with an iron-coloured wool, which, in a plant just expanding, stretches cross to the edge of the cap like a web. This species requires much broiling; but when sufficiently done and seasoned, it is as delicious as an oyster. It is found in woods in October. Hudson's bulbosus is only a variety of this plant.

The above are the only species that can be safely recommended as edible: though there are some other sorts which are frequently eaten by the country people; and it is probable the greatest part of those with firm fleshy caps might be eaten with safety, provided they were chosen from dry grounds. It is well known that soil and situation have a great influence upon the properties of plants; and these being of a singular nature, and absolutely between that of an animal and vegetable, may be more powerfully affected than a complete species of either, by reason they have neither leaves nor branches to carry off the noxious damps and vapours of a stagnant soil, as a perfect vegetable has; nor have they any gross excremental discharges, like those of a living animal. The gills no doubt do exhale some of their superfluous moisture; but their situation is such, that any thick steam from the earth may lodge in them, and by clogging their excretory ducts, render the plants morbid. Thus they soon run into a state of putrefaction, and become a

prey to worms, flies, and other insects. The common *Agaricus* mushroom, which is in general esteem (though we have several others better) is not safely eaten when produced upon a moist soil. Those who gather mushrooms for sale should therefore have particular regard to the lands they collect them from, especially if they know they are to be broiled; but if they be intended for catchup, perhaps they may be less cautious, as the salt and spices with which the juice is boiled may correct any evil disposition in the plants. But, even in this case, catchup made of mushrooms taken from a dry soil has a more aromatic and pleasant flavour than that which is made of those taken from a moist one, and it will always keep a great deal better.

Of the poisonous sorts, the two following are the most singular:

7. The muscarius, or reddish mushroom, has a large hat almost flat, either white, red, or crimson, sometimes beset with angular red warts; the gills are white, flat, and inversely spear-shaped; the pillar is hollow, the cap fixed to the middle of the pillar, limber, and hanging down. This species grows in pastures, and is said to destroy bugs effectually if the juice is rubbed upon the walls and bed-posts. The inhabitants of the north of Europe, whose houses are greatly infested with flies at the decline of summer, infuse it in milk, and set it in their windows, and the flies upon tasting the least drop are instantly poisoned. An infusion of common pepper in milk answers the same purpose: but the flies through time become wise enough not to taste it; and though vast numbers are at first destroyed, it is impossible to clear a house of these insects by this means.—This is the *moucho-more* of the Russians, Kamtschadales, and Koriacs, who use it as an instrument of intoxication. They sometimes eat it dry, sometimes immersed in a fermented liquor made with the epilobium, which they drink notwithstanding the dreadful effects. They are first seized with convulsions in all their limbs, then with a raving such as attends a burning fever. A thousand phantoms, gay or gloomy (according to their constitutions), present themselves to their imaginations: some dance, others are seized with unspeakable horrors. They personify this mushroom; and, if its effects urge them to suicide, or any dreadful crime, they say they obey its commands. To fit themselves for premeditated assassinations, they take the *moucho-more*. Such is the fascination of drunkenness among these people, that nothing can induce them to forbear this dreadful potion!

8. The clypeatus, or long-stalked mushroom, has an hemispherical hat tapering to a point, and clammy; the pillar is long, cylindrical, and white; the gills are white, and not concave, dusted with a fine powdery substance on each side; the root is bulbous, long, and hooked at the end. It is found in September, in woodlands and pastures. This species is thought to be poisonous; and we have the following account of the symptoms produced by eating it, in Dr Percival's Essays. "Robert Usherwood, of Middleton, near Manchester, a strong healthy man, aged 50 years, early in the morning gathered and eat what he supposed to be a mushroom. He felt no symptoms of indisposition, till five o'clock in the evening; when, being very thirsty, he drank near a quart of table-beer. Soon afterwards he became universally swollen, was sick, and in great agonies. A severe vomiting and purging succeeded,

Agaricus. succeeded, with violent cramps in his legs and thighs. He discharged several pieces of the fungus, but with little or no relief. His pains and evacuations continued, almost without intermission, till the next night; when he fell into a sound sleep, and awaked in the morning perfectly easy, and free from complaint."

Many of the different species of this genus grow on cows or horses dung, on dunghills, on rotten wood, in cellars, or on the trunks of trees; of which the most remarkable is,

9. The *quercinus*, or agaric of the oak. This is of various sizes, sometimes not exceeding the bigness of the fist, sometimes as large as a man's head. It takes at least an year or two to grow to its full size. It is dark coloured, hard, heavy, and woody; it is sometimes used by the dyers, as an ingredient in the black dye. It tastes at first sweetish in the mouth, but presently becomes very bitter and nauseous. It was formerly an article in the *Materia Medica*; but is now deservedly rejected from our pharmacopœias.

Culture. Only the esculent kinds of mushrooms are cultivated; and the following method is used by the gardeners who raise them for sale.—If the young mushrooms cannot be procured from gardens, they must be looked for in rich pastures during the months of August and September: the ground must be opened about their roots, where it is frequently found full of small white knots; which are the off-sets, or young mushrooms. These must be carefully gathered in lumps, with the earth about them: but as this spawn cannot be found in the pasture, except at that season when the mushrooms are naturally produced, it may be searched for at any time in old dung-hills, especially where there has been much litter, and it hath not been penetrated by wet so as to rot; it may also be found very often in old hot-beds; or it may be procured by mixing some long dung from the stable, which has not been thrown on a heap to ferment, with strong earth, and put under cover to prevent wet getting to it. The spawn commonly appears in about two months after the mixture is made; but proportionably sooner the more effectually the air is excluded, provided the mixture is not kept so close as to heat. Old thatch, or litter which has lain long abroad so as not to ferment, is the best covering. The spawn has the appearance of white mould shooting out into long strings, by which it may be easily known wherever it is met with.—The beds for receiving the spawn are now to be prepared. These should be made of dung in which there is plenty of litter, but which should not be thrown on a heap to ferment: that dung which has lain spread abroad for a month or longer is best. The beds should be made on dry ground, and the dung laid on the surface; the width at the bottom should be two and a half, or three feet, the length in proportion to the quantity of mushrooms desired; then lay the dung about a foot thick, covering it with strong earth about four inches deep. Upon this lay more dung, about ten inches thick; then another layer of earth, still drawing in the sides of the bed, so as to form it like the roof of a house; which may be done by three layers of dung, and as many of earth. When the bed is finished, it must be covered with litter or old thatch, both to prevent its drying too fast and to keep out wet. In this situation it ought to remain eight or ten days, when it will be in a proper tempe-

ture to receive the spawn; for this is destroyed by too much heat; though, before planting, it may be kept very dry, not only without detriment, but with considerable advantage.—The bed being in a proper temperature for the spawn, the covering of litter should be taken off, and the sides of the bed smoothed; then a covering of light rich earth, about an inch thick, should be laid all over the bed; but this should not be wet. Upon this the spawn must be thrust, laying the lumps two or three inches asunder: then gently cover this with the same light earth, above half an inch thick; and put the covering of litter over the bed, laying it so thick as to keep out wet, and prevent the bed from drying. In spring or autumn the mushrooms will begin to appear, perhaps in a month after making; but when the beds are made in summer or winter, they are much longer before they produce. In any season, however, they ought not to be hastily destroyed; since mushroom-beds have been known to produce very plentifully, even after the spawn has lain in them five or six months. When the beds are destroyed, the spawn should be carefully preserved, and laid up in a dry place, at least five or six weeks before it is again planted.—The difficulty of managing mushroom-beds is, to keep them always in a proper degree of moisture. In the summer season they may be uncovered to receive gentle showers of rain at proper times; and in long dry seasons the beds should now and then be watered, but much wet ought by no means to be suffered to come to them. During the winter season they must be kept as dry as possible, and so closely covered as to keep out cold. In frosty, or very cold weather, if some warm litter, shaken out of a dung-heap, is laid on, the growth of the mushrooms will be promoted: but betwixt this and the bed, a covering of dry litter must be interposed; which should be renewed as it decays; and, as the cold increases, the covering must be thickened. By attending to these directions, plenty of mushrooms may be produced all the year round. One bed will continue good for many months. For a peculiar, perhaps fabulous, method of producing mushrooms, see the article *LYNGURUS*.

Physicians have disputed much about the qualities of mushrooms; some considering them as a rich nourishment, and perfectly innocent, when properly chosen; and others asserting them to be extremely deleterious. Most of the fungi are indeed of a hurtful quality; and, with respect to the whole tribe, the esculent are very few. Esculent mushrooms are very nutritive, very readily alkalescent, and more so without intermediate acescency than any other vegetable: they are therefore a rich nourishment, and much akin to animal food; on which account they may be indulged in considerable quantity to strong persons. It requires, however, skill to distinguish this esculent kind; and very few, especially of those who are commonly employed to gather them, viz. the servants, have studied Clusius, or other authors who have been at the pains to distinguish them. Perhaps our esculent mushrooms, if old, acquire a dangerous acrimony; and for these reasons Dr Cullen is of opinion that it is for the most part prudent to avoid them. In the warmer climates, they may be used as light food; but here it is preposterous to use them along with animal food, as they do not correct its alkaline tendency.

AGATE,

Agate

AGATE, or ACHAT, (among the Greeks and Latins, *Αχατης*, and *Achates*, from a river in Sicily, on the banks of which it was first found), a very extensive genus of the semipellucid gems.

These stones are variegated with veins and clouds, but have no zones like those of the onyx. They are composed of chrystal debased by a large quantity of earth, and not formed, either by repeated incrustations round a central nucleus, or made up of plates laid evenly on one another; but are merely the effect of one simple concretion, and variegated only by the disposition given, by the fluid they were formed in, to their differently coloured veins or matters.

Agates are arranged according to the different colours of their ground. Of those with a white ground there are three species. (1.) The *dendrachates mocosa stone*, or *aborescent agate*. This seems to be the same with what some authors call the achates with rosemary in the middle, and others achates with little branches of black leaves. (2.) The *dull, milky-looking agate*. This, though greatly inferior to the former, is yet a very beautiful stone. It is common on the shores of rivers in the East Indies, and also in Germany and some other parts of Europe. Our lapidaries cut it into counters for card playing, and other toys of small value. (3.) The *lead-coloured agate*, called the *phassa-chates* by the ancients.

Of the agates with a *reddish* ground there are four species. (1.) An impure one of a flesh-coloured white, which is but of little beauty in comparison with other agates. The admixture of flesh-colour is but very slight; and it is often found without any clouds, veins, or other variegations; but sometimes it is prettily veined or variegated with spots of irregular figures, having fimbriated edges. It is found in Germany, Italy, and some other parts of Europe; and is wrought into toys of small value, and often into the German gun-flints. It has been sometimes found with evident specimens of the perfect mosses bedded deep in it. (2.) That of a pure blood colour, called *hemachates*, or the *bloody agate*, by the ancients. (3.) The clouded and spotted agate, of a pale flesh colour, called by the ancients the *carneian agate*, or *sardachates*. (4.) The red lead coloured one, variegated with yellow, called the *coral agate*, or *coralla-achates*, by the ancients.

Of the agates with a *yellowish* ground there are only two known species; the one of the colour of yellow wax, called *cerachates* by the ancients; the other a very elegant stone, of a yellow ground, variegated with white, black, and green, called the *leonina*, and *leonteseres* by the ancients.

Lastly, Of the agates with a *greenish* ground, there is only one known species, called by the ancients *jaspachates*.

Of all these species there are a great many varieties; some of them having upon them natural representations of men and different kinds of animals, &c. These representations are not confined to the agates whose ground is of any particular colour, but are occasionally found on all the different species. Velschius had in his custody a flesh-coloured agate, on one side of which appeared a half-moon in great perfection, represented by a milky semicircle; on the other side, the phases of *vesper*, or the evening-star: whence he denominated it an *aphrodisian agate*. An agate is mentioned by Kir-

cher*, on which was the representation of a heroine armed; and one in the church of St. Mark in Venice has the representation of a king's head adorned with a diadem. On another, in the museum of the prince of Gonzaga, was represented the body of a man with all his clothes in a running posture. A still more curious one is mentioned by de Boot†, wherein appears a circle struck in brown, as exactly as if done with a pair of compasses, and in the middle of the circle the exact figure of a bishop with a mitre on: but inverting the stone a little, another figure appears; and if it is turned yet further, two others appear, the one of a man, and the other of a woman. But the most celebrated agate of this kind is that of Pyrrhus, wherein were represented the nine muses, each with their proper attributes, and Apollo in the middle playing on the harp‡. In the emperor's cabinet is an oriental agate of a surprising bigness, being fashioned into a cup, whose diameter is an ell, abating two inches. In the cavity is found delineated in black specks, B. KRISTOR. S. XXX. Other agates have also been found, representing the numbers 4191, 191; whence they were called *arithmetical agates*, as those representing men or women have obtained the name of *anthropomorphous*.

Great medicinal virtues were formerly attributed to the agate, such as resisting poisons, especially those of the viper, scorpion, and spider; but they are now very justly rejected from medicinal practice. The oriental ones are all said to be brought from the river Gambay. A mine of agates was some time ago discovered in Transylvania, of divers colours; and some of a large size, weighing several pounds.

Agates may be stained artificially with solution of silver in spirit of nitre, and afterwards exposing the part to the sun; and though these artificial colours disappear on laying the stone for a night in aquafortis, yet a knowledge of the practicability of thus staining agates, must render those curious figures above-mentioned strongly suspected of being the work not of nature, but of art. Some account for these phenomena from natural causes. Thus, Kircher, who had seen a stone of this kind in which were depicted the four letters usually inscribed on crucifixes, I. N. R. I. apprehends that some real crucifix had been buried underground, among stones and other rubbish, where the inscription happening to be parted from the cross, and to be received among a soft mould or clay susceptible of the impression of the letters, came afterwards to be petrified. In the same manner he supposes the agate of Pyrrhus to have been formed. Others resolve much of the wonder into fancy, and suppose those stones formed in the same manner with the *camieux** or *Flo-mieux*†.

The agate is used for making cups, rings, seals, handles for knives and forks, hilts for swords and hangers, beads to pray with, smelling boxes, patch-boxes, &c. being cut or sawed with no great difficulty. At Paris, none have a right to deal in this commodity except the wholesale mercers and goldsmiths. The sword-cutlers are allowed to sell it, but only when made into handles for *couteaux de chasse*, and ready set in. The cutlers have the same privilege for their knives and forks.

Considerable quantities of these stones are still found near the river Achates in Sicily. There are found in some of these the surprising representations above-men-

Agate.

* Ephem. German. dec. i. an. 1. obs.

† De Gem.

l. ii. c. 95.

‡ Pliny.

l. xxxvii.

c. 3.

See Gem.

mieux.

Agate, mentioned, or others similar to them. By a dexterous management of these natural stains, medals have been produced, which seem master pieces of nature: for this stone bears the graver well; and as pieces of all magnitudes are found of it, they make all sorts of work of it. The high altar of the cathedral of Messina is all over encrusted with it. The lapidaries pretend that the Indian agates are finer than the Sicilian; but Father Labat* informs us, that in the same quarries, and even in the same block, there are found pieces much finer than others, and these fine pieces are sold for Indian agates in order to enhance their price.

AGATE, among antiquaries, denotes a stone of this kind engraven by art. In this sense, agates make a species of antique gems; in the workmanship whereof we find eminent proofs of the great skill and dexterity of the sculptors. Several agates of exquisite beauty are preserved in the cabinets of the curious; but the facts or histories represented on these antique agates, however well executed, are now become so obscure, and their explications so difficult, that several diverting mistakes and disputes have arisen among those who undertook to give their true meaning.

The great agate of the apotheosis of Augustus, in the treasury of the holy chapel, when sent from Constantinople to St Lewis, passed for a triumph of Joseph. Hist. Acad. R. Inscript. tom. i. p. 337, — 344. An agate, now in the French king's cabinet, had been kept 700 years with great devotion, in the Benedictine abbey of St Evre at Toul, where it passed for St John the Evangelist carried away by an eagle, and crowned by an angel; but the Heathenism of it having been lately detected, the religious would no longer give it a place among their relics, but presented it in 1684 to the king. The antiquaries found it to be the apotheosis of Germanicus. In like manner the triumph of Joseph was found to be a representation of Germanicus and Agrippina, under the figures of Ceres and Triptolemus. Another was preserved, from time immemorial, in one of the most ancient churches of France, where it had passed for a representation of paradise and the fall of man; there being found on it two figures representing Adam and Eve, with a tree, a serpent, and a Hebrew inscription round it, taken from the third chapter of Genesis, "The woman saw that the tree was good," &c. The French academists, instead of our first parents, found Jupiter and Minerva represented by the two figures: the inscription was of a modern date, written in a Rabbinical character, very incorrect, and poorly engraven. The prevailing opinion was, that this agate represented simply the worship of Jupiter and Minerva at Athens.

AGATE, is also a name of an instrument used by gold-wire-drawers; so called from the agate in the middle of it, which forms its principal part.

AGATHIAS, or, as he calls himself in his epigrams, **AGATHIUS**, distinguished by the title of *Scholasticus* a Greek historian in the 6th century under Justinian. He was born at Myrina, a colony of the ancient Æolians, in Asia the less, at the mouth of the river Phythicus. He was an advocate at Smyrna. Tho' he had a taste for poetry, he was yet more famous for his history, which begins with the 26th year of Justinian's reign, where Procopius ends. It was printed in Greek and Latin, with Bonaventure Vulcanius's, at

VOL. I. Part I.

Leyden, 1594, in 4to; and in Paris at the king's printing-house, 1660, in folio.

AGATHO, a tragic and comic poet, disciple to Prodicus and Socrates, applauded in Plato's Dialogues for his virtue and beauty. His first tragedy obtained the prize; and he was crowned in the presence of upwards of 30,000 men, the 4th year of the 90th Olympiad. There is nothing now extant of his, except a few quotations in Aristotle, Athenæus, and others.

AGATHOCLES, the famous tyrant of Sicily, was son of a potter at Reggio. He was a thief, a common soldier, a centurion, a general, and a pirate, all in a regular succession. He defeated the Carthaginians several times in Sicily, and was once defeated himself. He first made himself tyrant of Syracuse, and then of all Sicily; after which he vanquished the Carthaginians again both in Sicily and Africa. But at length having ill success, and being in arrears with his soldiers, they mutinied, forced him to fly his camp, and cut the throats of his children, whom he left behind. Recovering himself again, he relieved Corfu, besieged by Cassander; burnt the Macedonian fleet; returned to Sicily; murdered the wives and children of those who had murdered his; afterwards meeting with the soldiers themselves, he put them all to the sword; and ravaging the sea-coast of Italy, took the city of Hipponium. He was at length poisoned by his grandson Archagathus, in the 72d year of his age, 290 years before Christ, having reigned 28 years.

AGATHYRNA, or **AGATHYRNUM**, **AGATHYRSA**, or **AGATHYRSUM**, (anc. geog.), a town of Sicily; now *St Marco*; as old as the war of Troy, being built by Agathyrnus, son of Æolus, on an eminence. The gentilitious name is *Agathyrneus*: or, according to the Roman idiom, *Agathyrneusis*.

AGAVE, the common American aloe: A genus of the monogynia order, belonging to the hexandria class of plants; and in the natural method ranking under the 10th order, *Coronaria*. The characters are: There is no calyx: The corolla is monopetalous and funnel-shaped; the border six-parted, with lanced erect divisions: The stamina consist of six erect filaments, longer than the corolla; the antheræ are linear, shorter than the filaments, and versatile: The pistillum is an oblong germen; the stylus is filiform, the length of the stamina, and triangular; the stigma headed and triangular: The pericarpium is an oblong triangular capsule, trilocular and three-valved: The seeds are numerous. Of this genus, botanical writers enumerate eight species.

Of the Americana, or great American aloe, the stems generally rise upwards of 20 feet high, and branch out on every side towards the top, so as to form a kind of pyramid: the slender shoots being garnished with greenish yellow flowers, which stand erect, and come out in thick clusters at every joint: these make a fine appearance, and continue long in beauty; a succession of new flowers being produced for near three months in favourable seasons, if the plant is protected from the autumnal colds. The seeds do not ripen in England. It has been generally thought, that these plants do not flower till they are 100 years old: but this is a mistake; for the time of their flowering depends on their growth: so that in hot countries, where they grow fast, and ex-

G g

pand

Agathio,
Agave.

Adge,
Age.

pand many leaves every season, they will flower in a few years; but in colder climates, where their growth is slow, it will be much longer before they shoot up their stem. There is a variety of this species with striped leaves, which are pretty common in the English gardens. The other sorts are so tender, that they must constantly remain in the stove.

ADGE, a city of France, in Lower Languedoc, in the territory of Agadez, with a bishop's see. The diocese is small, but is one of the richest countries in the kingdom. It produces fine wool, wine, oil, corn, and silk. It is seated on the river Eraut, a mile and a quarter from its mouth, where it falls into the gulph of Lyons, and where there is a fort built to guard its entrance. It is well peopled; the houses are built of black stone, and there is an entrance into the city by four gates. The greatest part of the inhabitants are merchants or seamen. The public buildings are but mean: the cathedral is small, and not very handsome: the bishop's palace is an old building, but convenient. The city is extended along the river, where it forms a little port, wherein small craft may enter. There is a great concourse of pilgrims and other devout people to the chapel of Notre Dame de Grace. It is a little without the city, between which and the chapel there are about 13 or 14 oratories, which they visit with naked feet. The convent of the Capuchins is well built, and on the outside are lodgings and apartments for the pilgrims who come to perform their *neuvaine* or nine days devotion. The chapel, which contains the image of the Virgin Mary, is distinct from the convent. E. Long. 3. 20. Lat. 43. 19.

AGE, in the most general sense of the word, signifies the duration of any being, from its first coming into existence to the time of speaking of it, if it still continues; or to its destruction, if it has ceased to exist some time before we happen to mention it.

Among the ancient poets, this word was used for the space of thirty years; in which sense, *age* amounts to much the same with *generation*. Thus, Nestor is said to have lived *three ages* when he was 90 years old.—By ancient Greek historians, the time elapsed since the beginning of the world is divided into three periods, which they called *ages*. The first reaches from the creation to the deluge which happened in Greece during the reign of Ogyges; this they called the *obscure* or *uncertain age*, because the history of mankind is altogether uncertain during that period. The second they call the *fabulous* or *heroic age*, because it is the period in which the fabulous exploits of their gods and heroes are said to have been performed. It began with the Ogygian deluge, and continued to the first Olympiad; where the third or *historical age* commenced.—This division, however, it must be observed, holds good only with regard to the Greeks and Romans, who had no histories earlier than the first Olympiad; the Jews, Egyptians, Phenicians, and Chaldees, not to mention the Indians and Chinese, who pretend to much higher antiquity, are not included in it.

The interval since the first formation of man has been divided by the poets into four *ages*, distinguished by the epithets of *golden*, *silver*, *brazen*, and *iron*. During the *golden age*, Saturn reigned in heaven, and justice and innocence in this lower world. The earth then

yielded her productions without culture; men held all things in common, and lived in perfect friendship. This period is supposed to have lasted till the expulsion of Saturn from his kingdom. The *silver age* commenced when men began to deviate from the paths of virtue; and in consequence of this deviation, their lives became less happy. The *brazen age* commenced on a farther deviation, and the *iron age* took place in consequence of one still greater.—A late author, however, reflecting on the barbarism of the first ages, will have the order which the poets assign to the four ages inverted; the first being a time of rudeness and ignorance, more properly denominated an *iron* than a *golden age*. When cities and states were founded, the *silver age* commenced; and since arts and sciences, navigation and commerce, have been cultivated, the *golden age* has taken place.

In some ancient northern monuments, the *rocky* or *stony age* corresponds to the *brazen age* of the Greeks. It is called *rocky*, on account of Noah's ark, which rested on mount Ararat; whence men were said to be descended or sprung from mountains: or from Deucalion and Pyrrha restoring the race of mankind, by throwing stones over their heads. The northern poets also style the fourth age of the world the *ashen age*, from a Gothic king Madenis, or Mannus, who on account of his great strength was said to be made of ash, or because in his time people began to make use of weapons made of that wood.

Among the Jews, the duration of the world is also divided into three ages. 1. The *seculum inane*, or *void age*, was the space of time from the creation to Moses. 2. The *present age*, denotes all the space of time from Moses to the coming of the Messiah; and, 3. The *age to come*, denotes the time from the coming of the Messiah to the end of the world.

Various other divisions of the duration of the world into *ages* have been made by historians.—The Sibylline oracles, wrote, according to some, by Jews acquainted with the prophecies of the Old Testament, divide the duration of the world into ten *ages*; and according to Josephus, each age contained six hundred years. It appears, by Virgil's fourth eclogue, and other testimonies, that the age of Augustus was reputed the end of those ten *ages*, consequently as the period of the world's duration.

By some, the space of time commencing from Constantine, and ending with the taking of Constantinople by the Turks in the 15th century, is called the *middle age*; but others choose rather to date the middle age from the division of the empire made by Theodosius at the close of the 4th century, and extend it to the time of the emperor Maximilian I. in the beginning of the 16th century, when the empire was first divided into circles.—The *middle* is by some denoted the *barbarous age*, and the latter part of it the *lowest age*. Some divide it into the *non-academical* and *academical ages*. The first includes the space of time from the 6th to the 9th centuries, during which schools or academies were lost in Europe. The second from the 9th century, when schools were restored, and universities established, chiefly by the care of Charlemagne.

The several *ages* of the world may be reduced to three grand epochas, viz. the *age* of the law of nature, called by

Age.

Age, by the Jews the *void age*, from Adam to Moses; the *age* of the Jewish law, from Moses to Christ; and the *age* of grace, from Christ to the present year.

Agema.

AGE is also frequently used in the same sense with *century*, to denominate a duration of 100 years.

AGE likewise signifies a certain period of the duration of human life; by some divided into four stages, namely, infancy, youth, manhood, and old age; the first extending to the 14th year, the second to the 25th, the third to the 50th, and the fourth to the end of life: by others divided into infancy, childhood, youth, manhood, and old age.

AGE, in law, signifies a certain period of life, when persons of both sexes are enabled to do certain acts. Thus, one at twelve years of age ought to take the oath of allegiance to the king in a leet; at fourteen he may marry, chuse his guardian, and claim his lands held in soccage. Twenty-one is called *full age*, a man or woman being then capable of acting for themselves, of managing their affairs, making contracts, disposing of their estates, and the like.

AGE of a Horse. See **HORSE**.

AGE of Trees. These after a certain age waste. An oak at an hundred years old ceases to grow. The usual rule for judging of the *age* of wood, is by the number of circles which appear in the substance of a trunk or stock cut perpendicularly, each circle being supposed the growth of a year; though some reject this method as precarious, alledging, that a simple circle is sometimes the produce of several years; besides that, after a certain age, no new circles are formed.

AGE-prier, in law, is when an action being brought against a person under age, for lands descended to him, he, by motion or petition, shews the matter to the court, praying the action may be staid till his full age, which the court generally agrees to.

AGELNOTH, **EGELNOTH**, or **ÆTHELNOTH**, in Latin *Achelnodus*, archbishop of Canterbury, in the reign of Canute the Great, succeeded Livingus in that see in the year 1020. This prelate, surnamed the *Good*, was son of earl Agilmer, and at the time of his election, dean of Canterbury. After his promotion he went to Rome, and received his pall from Pope Benedict VIII. In his way thither, as he passed through Pavia, he purchased, for an hundred talents of silver and one of gold, St Augustin's arm, which was kept there as a relic; and sent it over to England as a present to Leofric earl of Coventry. Upon his return, he is said to have raised the see of Canterbury to its former lustre. He was much in favour with king Canute, and employed his interest with that monarch to good purposes. It was by his advice the king sent over large sums of money for the support of the foreign churches; and Malmesbury observes, that this prince was prompted to acts of piety, and restrained from excesses, by the regard he had for the archbishop. Agelnoth, after he had sat 17 years in the see of Canterbury, departed this life the 29th of October 1038, and was succeeded by Eadsius, king Harold's chaplain.—This archbishop was an author, having written, 1. A Panegyric on the blessed Virgin Mary. 2. A Letter to earl Leofric concerning St Augustin. 3. Letters to several persons.

AGEMA, in Macedonian antiquity, was a body of soldiery, not unlike the Roman legion.

AGEMOGLANS, **AGIAMOGLANS**, or **AZAMOGLANDS**, in the Turkish polity, are children purchased from the Tartars, or raised every third year, by way of tribute from the Christians tolerated in the Turkish empire. These, after being circumcised and instructed in the religion and language of their tyrannical masters, are learned the exercises of war, till they are of a proper age for carrying arms; and from this corps the janissaries are recruited. With regard to those who are thought unfit for the army, they are employed in the lowest offices of the seraglio. Their appointments also are very small, not exceeding seven aspers and a half per day, which amount to about threepence-halfpenny of our money.

AGEN, a city of France, on the river Garonne, the capital of Agenois in Guienne, and the see of a bishop. The gates and old walls, which are yet remaining, shew that this city is very ancient, and that its former circuit was not so great as the present. The palace, wherein the presidial holds his sessions at this day, was heretofore called the castle of Montravel, and is seated without the walls of the old city, and on the side of the fosse. There are likewise the ruins of another castle called *La Sagne*, which was without the walls close by a brook. Though the situation of Agen is very convenient for trade and commerce, the inhabitants are so very indolent that there is very little; of which the neighbouring cities take the advantage. It is seated on the bank of the river Garonne, in a pleasant country; but is itself a very mean and disagreeable place, the houses being ill-built, and the streets narrow, crooked, and dirty. E. Long. 0.30 N. Lat. 44 12.

AGENDA, among philosophers and divines, signifies the duties which a man lies under an obligation to perform: thus we meet with the agenda of a Christian, or the duties he ought to perform; in opposition to the *credenda*, or things he is to believe.

AGENDA, among merchants, a term sometimes used for a memorandum-book, in which is set down all the business to be transacted during the day, either at home or abroad.

AGENDA, among ecclesiastical writers, denotes the service or office of the church. We meet with *agenda matutina & vespertina*, "morning and evening prayers;" *agenda dici*, "the office of the day," whether feast or fast day; *agenda mortuorum*, called also simply *agenda*, "the service of the dead."

AGENDA, is also applied to certain church-books; compiled by public authority, prescribing the order and manner to be observed by the ministers and people in the principal ceremonies and devotions of the church. In which sense *agenda* amounts to the same with what is otherwise called *ritual*, *liturgy*, *acolythia*, *missal*, *formulary*, *directory*, &c.

AGENHINE, in our old writers, signifies a guest that has lodged at an inn for three nights, after which time he was accounted one of the family; and if he offended the king's peace, his host was answerable for him. It is also written **HOGENHINE** and **HOGENHYN**.

AGENORIA, in mythology, the goddess of courage and industry, as *Vacuna* was of indolence.

AGENT, in a general sense, denotes any active power or cause. Agents are either natural or moral. Natural agents are such inanimate bodies as have a

**Agemo-
glans,
Agent.**

Agent, power to act upon other bodies in a certain and determinate manner; as, gravity, fire, &c. Moral agents, on the contrary, are rational creatures, capable of regulating their actions by a certain rule.

Agefilaus.

AGENT, is also used to denote a person intrusted with the management of an affair, whether belonging to a society, company, or private person.

AGENTES in rebus, one of the ranks of officers in the court of the Constantinopolitan emperors, whose business was to collect and convey the corn both for the army and household; to carry letters and messages from court to all parts of the empire; to regulate couriers, and their vehicles; to make frequent journeys and expeditions through the provinces, in order to inspect any motions, disturbances, or machinations tending that way, and to give early notice thereof to the emperor.

The *agentes in rebus*, are by some made synonymous with our post-masters, but their functions were of great extent. They correspond to what the Greeks call *αγορευοι*, and the Latins *veredarii*.

There were various orders or degrees of *agentes in rebus*; as, *tribuni*, *primicerii*, *senatores*, *ducenarii*, *biarchi*, *circitores*, *equites*, *tyrones*, &c. through all which they rose *gradatim*. Their chief, who resided at Constantinople, was denominated *princeps*; which was a post of great dignity, being reckoned on a level with that of proconsul. They were settled in every part of the empire; and are also said to have served as interpreters.

AGER, in Roman antiquity, a certain portion of land allowed to each citizen. See **AGRARIAN LAW**.

AGER PICENUS, or *Picenum*, (anc. geog.), a territory of Italy to the south-east of Umbria, reaching from the Apennine to the Adriatic. The people are called *Picentes* (Cicero, Livy), distinct from the Picentini on the Tuscan sea, though called by Greek writers *Πικεντινοι*. This name is said to be from the bird *Picus*, under whose conduct they removed from the Sabines, of whom they were a colony.

AGERATUM, BASTARD HEMP, AGRIMONY: *Agenus* of the polygamia æqualis order, belonging to the syngenesia class of plants; and in the natural method ranking under the 49th order, *Compositæ discoides*. The characters are: The common *calyx* is oblong, with many scales. The compound *corolla* is uniform; the corollets hermaphrodite, tubular, and numerous: the proper corolla is funnel-shaped; the border 4-cleft, and expanded. The *filamina* consist of 5 capillary very short filaments; the anthera is cylindric and tubular. The *pistillum* is an oblong germen; with a filiform stylus, and two slender erect stigmata. There is no *pericarpium*; the *calyx* unchanged. The *seeds* are solitary, oblong, and angular. The *receptaculum* is naked, convex, and very small. Of this genus there are three

Species; the *conyzoides*, the *houstonianum*, and the *altissimum*. All these are natives of warm climates. The two first are annual plants, and consequently can be propagated only by seeds; which, however, come to perfection in this country. The third species will bear the severest cold of this country, but its seeds do not ripen in it.

AGERATUM, or MAUDLIN. See **ACHILLEA**.

AGESILAUS, king of the Lacedæmonians, the son of Archidamus, was raised to the throne notwithstanding the superior claim of Leotychides. As soon

as he came to the throne, he advised the Lacedæmonians to be beforehand with the king of Persia, who was making great preparations for war, and to attack him in his own dominions. He was himself chosen for this expedition; and gained so many advantages over the enemy, that if the league which the Athenians and the Thebans formed against the Lacedæmonians had not obliged him to return home, he would have carried his victorious arms into the very heart of the Persian empire. He gave up, however, all these triumphs readily, to come to the succour of his country, which he happily relieved by his victory over the allies in Bœotia. He obtained another near Corinth; but to his great mortification, the Thebans afterward gained several over the Lacedæmonians. These misfortunes at first raised somewhat of a clamour against him. He had been sick during the first advantages which the enemy gained; but as soon as he was able to act in person, by his valour and prudence he prevented the Thebans from reaping the advantages of their victories; insomuch that it was generally believed, had he been in health at the beginning, the Lacedæmonians would have sustained no losses, and that all would have been lost had it not been for his assistance. It cannot be denied but he loved war more than the interest of his country required; for if he could have lived in peace, he had saved the Lacedæmonians several losses, and they would not have been engaged in many enterprises which in the end contributed much to weaken their power. He died in the third year of the 104th Olympiad, being the 84th year of his age, and 41st year of his reign. Agefilaus would never suffer any picture or sculpture to be made of him, and prohibited it also by his will: this he is supposed to have done from a consciousness of his own deformity; for he was of a short stature, and lame of one foot, so that strangers used to despise him at the first sight. His fame went before him into Egypt, and there they had formed the highest idea of Agefilaus. When he landed in that country, the people ran in crowds to see him: but great was their surprise when they saw an ill-dressed, slovenly, mean-looking little fellow lying upon the grass: they could not forbear laughing, and applied to him the fable of the mountain in labour. He was, however, the first to jest upon his own person; and such was the gaiety of his temper, and the strength with which he bore the roughest exercises, that these qualities made amends for his corporal defects. He was extremely remarkable for plainness and frugality in his dress and way of living. "This (says Cornelius Nepos) is especially to be admired in Agefilaus: when very great presents were sent him by kings, governors, and states, he never brought any of them to his own house; he changed nothing of the diet, nothing of the apparel of the Lacedæmonians. He was contented with the same house in which Euristhenes, the founder of his family, had lived: and whoever entered there, could see no sign of debauchery, none of luxury; but on the contrary, many of moderation and abstinence; for it was furnished in such a manner, that it differed in nothing from that of any poor or private person." Upon his arrival into Egypt, all kind of provisions were sent to him; but he chose only the most common, leaving the perfumes, the confections, and all that was esteemed most delicious to his servants. Agefilaus was extremely fond of his children, and would often amuse himself by joining

Agga,
Agger.

joining in their diversions: one day when he was surprised riding upon a stick with them, he said to the person who had seen him in this posture, "Forbear talking of it till you are a father."

AGGA, or AGGONNA, a British settlement on the gold coast of Guinea. It is situated under the meridian of London, in 6 degrees of N. lat.

AGGER, in the ancient military art, a work of fortification, used both for the defence and the attack of towns, camps, &c. In which sense it is the same with what was otherwise called *vallum*, and in later times *aggerum*; and among the moderns *lines*, sometimes *cavaliers*, *terrasses*, &c. The agger was usually a bank, or elevation of earth or other matter, bound and supported with timber; having sometimes turrets on the top, wherein the workmen, engineers, and soldiery, were placed. It was also accompanied with a ditch, which served as its chief defence. The usual materials of which it was made were earth, boughs, fascines, stakes, and even trunks of trees, ropes, &c. variously crossed, and interwoven somewhat in the figure of stars; whence they were called *stellati axes*. Where these were wanting, stones, bricks, tiles, supplied the office: on some occasions, arms, utensils, pack-saddles, were thrown in to fill it up. We even read of aggers formed of the carcases of the slain; sometimes of dead bones mixed with lime; and even with the heads of slaughtered citizens. For want of due binding, or solid materials, aggers have sometimes tumbled down, with infinite mischief to the men. The besiegers used to carry on a work of this kind nearer and nearer towards the place, till at length they reached the very wall. The methods taken, on the other side, to defeat them, were by fire, especially if the agger were of wood; by sapping and undermining, if of earth; and in some cases, by erecting a counter agger.

The height of the agger was frequently equal to that of the wall of the place. Cæsar tells us of one he made, which was 30 feet high and 330 feet broad. Besides the use of aggers before towns, the generals used to fortify their camps with such works; for want of this precaution, armies have often been surprised and ruined.

There were vast aggers made in towns and places on the sea-side, fortified with towers, castles, &c. Those made by Cæsar and Pompey at Brundisium, are famous. Sometimes aggers were even built across arms of the sea, lakes, and morasses; as was done by Alexander before Tyre, and by M. Antony and Cassius.—The wall of Severus, in the north of England, may be considered as a grand agger, to which belong several lesser ones. See *SEVERUS'S Wall*.

AGGER, in ancient writers, likewise denotes the middle part of a military road, raised into a ridge, with a gentle slop on either side, to make a drain for the water, and keep the way dry.

The term is also used for the whole road, or military way. Where highways were to be made in low grounds as between two hills, the Romans used to raise them above the adjacent land, so as to make them of a level with the hills. These banks they called *aggeres*. Ber gier mentions several in Gallia Belgica, which were thus raised, ten, fifteen, or twenty feet above ground.—They are sometimes also called *aggeres calcæati*; and

now generally known by the name *chauffees*, or *causeways*. Aggerhuys

AGGERHUYS, a city of Norway, capital of the province of the same name. It is subject to Denmark, and situated in E. Long. 28. 35. and N. Lat. 59. 30.

AGGERS-HERRED, a district of Christiansand and a diocese of Norway. It consists of three juridical places; namely, Ascher, West Barm, and Ager.

AGGLUTINANTS, in pharmacy, a general name for all medicines of a glutinous or viscid nature; which, by adhering to the solids, contribute greatly to repair their loss.

AGGLUTINATION, in a general sense, denotes the joining two or more things together, by means of a proper glue or cement.

AGGLUTINATION, among physicians, implies the action of reuniting the parts of a body, separated by a wound, cut, &c. It is also applied to the action of such internal medicines as are of an agglutinating quality, and which, by giving a glutinous consistence to the animal fluids, render them more proper for nourishing the body.

AGGREGATE, in a general sense denotes the sum of several things added together, or the collection of them into one whole. Thus, a house is an aggregate of stones, wood, mortar, &c. It differs from a mixed or compound, inasmuch as the union of these last is more intimate than between the parts of an aggregate.

AGGREGATE, in botany, is a term used to express those flowers, which are composed of parts or florets, so united by means either of the receptacle or calyx, that no one of them can be taken away without destroying the form of the whole. They are opposed to simple flowers, which have no such common part, and are usually divided into seven kinds, viz. the *aggregate*, properly so called, whose receptacle is dilated, and whose florets are supported by foot-stalks; such are the blue daisy, thrift, or sea-pink, &c.; the *compound*; the *umbellati*; the *cymose*; the *amentaceous*; the *glumose*; and the *spadiceous*.

AGGREGATION, in physics, a species of union, whereby several things which have no natural dependence or connection with one another are collected together, so as in some sense to constitute one. Thus, a heap of sand, or a mass of ruins, are bodies by aggregation.

AGHER, a town of Ireland, which sends two members to parliament. It is situated in the southern part of Ulster, not far from Clogher.

AGHRIM, a town of Ireland, in the county of Wicklow, and province of Leinster, situated about 13 miles south-west of Wicklow.

AGHRIM, in Galway; a small village, distant about 32 miles from Dublin, and rendered memorable by a decisive battle fought there, and at Kilcommodon-hill, the 12th of July 1691, between general Ginckle and Monsieur St Ruth, the commanders under king William III. and James II. when St Ruth, the general of the Irish army, with 7000 of his men, were slain; but of the English only 600. The victory was the more considerable, as the English army consisted of no more than 18,000 men; whereas the Irish were computed at 20,000 foot and 5000 horse and dragoons. They lost likewise nine pieces of brass cannon; all their ammunition,

Agades, tion, tents, and baggage; most of their small arms, which they threw away to expedite their flight; with 11 standards, and 32 pair of colours.

AGIADES, in the Turkish armies, a kind of pioneers employed in fortifying camps, smoothing of roads, and the like offices.

AGILITY, an aptitude of the several parts of the body to motion.—The improving of agility was one of the chief objects of the institution of games and exercises. The athletes made particular profession of the science of cultivating and improving agility. Agility of body is often supposed peculiar to some people; yet it seems less owing to any thing peculiar, in their frame and structure, than to practice.

AGINCOURT, a village of the French Netherlands, situated in E. Long. 2. 10. N. Lat. 50. 35; famous on account of the victory obtained by Henry V. of England over the French, in 1415.

The army of Henry, after landing in France, was by various accidents reduced to 10,000 men, of whom not a few were sick, or slowly recovering from sickness;—they had to traverse a long tract of country, inhabited by exasperated enemies, from whom they were to procure provisions, lodgings, guides, intelligence, and every thing they wanted;—that country was defended by many strong towns, intersected by deep rivers, and guarded by an army of 100,000, or (according to some contemporary writers) 140,000 men.

Henry, undaunted by all these dangers and difficulties, departed from Harfleur, marching his army in three lines, with bodies of cavalry on the wings. He proceeded by very easy journeys, that he might not fatigue his troops, or discourage them by the appearance of a flight; observing the strictest discipline, and paying generously for every thing he received; which induced the country people to bring provisions to his camp, in spite of all the commands they had received to the contrary. To keep his men in spirits, and from repining, the king fared as ill as the meanest soldier, always appearing with a cheerful countenance, and addressing them in the most friendly and encouraging language. They arrived at the village of Agincourt, in the county of St Pol, on the evening of October 24th; and there beheld the whole French army, at a small distance, directly in their route. The king took an attentive view of it from an eminence; and being fully convinced that it was impossible to proceed any further on his way to Calais without a battle, and equally impossible to return to Harfleur with so great an army in his rear, he resolved to hazard an action next morning, as the only means of preserving himself and his little army from destruction.

The English army lodged that night in the villages of Agincourt, Maisonneville, and some others; where they met with better accommodation than they had been accustomed to for some time past, and spent part of their time in mutual exhortations to fight bravely in the approaching battle. The king, overhearing some of his nobles expressing a wish that the many brave men who were idle in England were present to assist them, is said to have cried out—"No! I would not have one man more:—if we are defeated, we are too many—if it shall please God to give us the victory, as I trust he will, the smaller our number the greater our glory." The moon happening to shine very bright,

Henry, with some of his best officers, carefully examined the ground, and pitched upon a field of battle, admirably calculated to preserve a small army from being surrounded by a great one. It was a gentle declivity from the village of Agincourt, of sufficient extent for his small army, defended on each side by hedges, trees, and brush-wood. Having placed guards and kindled fires on all sides, the king and his army betook themselves to rest; except such as were of a more serious turn of mind, and, considering that as the last night of their lives, spent it in devotion.

The French, exulting in their numbers, confident of victory, and abounding in provisions, spent the night in noisy festivity, and in forming fanciful schemes about the disposal of their prisoners and their booty. It was in general resolved to put all the English to the sword, except the king and the chief nobility, who were to be taken prisoners for the sake of their ransoms.

On the morning of Friday, the memorable 25th of October, A. D. 1415, the day of Crispin and Crispianus, the English and French armies were ranged in order of battle, each in three lines, with bodies of cavalry on each wing. The Constable D'Albert, who commanded the French army, fell into the snare that was laid for him, by drawing up his army in the narrow plain between the two woods. This deprived him, in a great measure, of the advantage he should have derived from the prodigious superiority of his numbers; obliged him to make his lines unnecessarily deep, about 30 men in file; to crowd his troops, particularly his cavalry, so close together, that they could hardly move or use their arms; and, in a word, was the chief cause of all the disasters that followed. The French, it is said, had a considerable number of cannon of different sizes in the field; but we do not hear that they did any execution, probably for want of room. The first line of the French army, which consisted of 8000 men-at-arms on foot mixed with 4000 archers, with 500 men-at-arms mounted on each wing, was commanded by the Constable D'Albert, the dukes of Orleans and Bourbon, and many other nobles; the dukes of Alençon, Brabant, and Bar, &c. conducted the second line; and the earls of Marle, Damartine, Fauconberg, &c. were at the head of the third line. The king of England employed various arts to supply his defect of numbers. He placed 200 of his best archers in ambush, in a low meadow, on the flank of the first line of the French. His own first line consisted wholly of archers, four in file; each of whom, besides his bow and arrows, had a battle-axe, a sword, and a stake pointed with iron at both ends, which he fixed before him in the ground, the point inclining outwards, to protect him from cavalry; which was a new invention, and had a happy effect. That he might not be encumbered, he dismissed all his prisoners, on their word of honour to surrender themselves at Calais, if he obtained the victory; and lodged all his baggage in the village of Agincourt, in his rear, under a slender guard. The command of the first line was, at his earnest request, committed to Edward duke of York, assisted by the lords Beaumont, Willoughby, and Fanhope; the second was conducted by the king, with his youngest brother Humphry duke of Gloucester, the earls of Oxford, Marshal, and Suffolk; and the third was led by the duke

Agincourt. Duke of Exeter, the king's uncle. The lines being formed, the king, in shining armour, with a crown of gold adorned with precious stones on his helmet, mounted on a fine white horse, rode along them, and addressed each corps with a cheerful countenance and animating speeches. To inflame their resentment against their enemies, he told them, that the French had determined to cut off three fingers of the right hand of every prisoner; and to rouse their love of honour, he declared, that every soldier in that army who behaved well, should from henceforth be deemed a gentleman, and intitled to bear coat-armour.

When the two armies were drawn up in this manner, they stood a considerable time gazing at one another in solemn silence. But the king, dreading that the French would discover the danger of their situation and decline a battle, commanded the charge to be sounded, about ten o'clock in the forenoon. At that instant, the first line of the English kneeled down, and kissed the ground; and then starting up, discharged a flight of arrows, which did great execution among the crowded ranks of the French. Immediately after, upon a signal being given, the archers in ambush arose, and discharged their arrows on the flank of the French line, and threw it into some disorder. The battle now became general, and raged with uncommon fury. The English archers, having expended all their arrows, threw away their bows, and, rushing forward, made dreadful havoc with their swords and battle-axes. The first line of the enemy was, by these means, defeated; its leaders being either killed or taken prisoners. The second line, commanded by the duke D'Alençon, (who had made a vow either to kill or take the king of England, or to perish in the attempt), now advanced to the charge, and was encountered by the second line of the English, conducted by the king. This conflict was more close and furious than the former. The duke of Gloucester, wounded and unhorsed, was protected by his royal brother till he was carried off the field. The duke D'Alençon forced his way to the king, and assaulted him with great fury; but that prince brought him to the ground, where he was instantly dispatched. Discouraged by this disaster, the second line made no more resistance; and the third fled without striking a blow; yielding a complete and glorious victory to the English, after a violent struggle of three hours duration.

The king did not permit his men to pursue the fugitives to a great distance, but encouraged them to take as many prisoners as they could on or near the field; in which they were so successful, that, in a little time, his captives were more numerous than his soldiers. A great proportion of these prisoners were men of rank and fortune; for many of the French noblesse being on foot, and loaded with their heavy armour, could not make their escape. Among these were the dukes of Orleans and Bourbon, the marshal Boucicaut, the counts D'Eu, Vendome, Richemont, and Harcourt, and 7000 barons, knights, and gentlemen. The French left dead on the field of battle, the constable D'Albert, the three dukes of Alençon, Brabant, and Bar, the archbishop of Sens, one marshal, 13 earls, 92 barons, 1500 knights, and a far greater number of gentlemen, besides several thousands of common soldiers. Even the French historians acknowledge, that the loss of the English

was inconsiderable: those of our own contemporary writers who make it the greatest, affirm, that it did not exceed 100, and that the duke of York and the earl of Suffolk were the only great men who fell on that side in this memorable action.

AGIO, in commerce, is a term chiefly used in Holland, and at Venice, to signify the difference between the value of bank-stock and the current coin. The agio in Holland is generally three or four *per cent.* and at Rome it is from 15 to 25 *per cent.* but at Venice the agio is fixed at 20 *per cent.*

AGIOSYMANDRUM, a wooden instrument used by the Greek and other churches under the dominion of the Turks, to call together assemblies of the people. The *agiosymandrum* was introduced in the place of bells, which the Turks prohibited their Christian subjects the use of, lest they should make them subservient to sedition.

AGIS, king of Lacedæmon, was descended from Agesilaus II. in a right line. He projected the reformation of his kingdom, by the restoring of the laws of Lycurgus; but he fell under the weight of an enterprise that could not but be disagreeable to all those who had great possessions, and had been long accustomed to the sweets of a voluptuous life. Agis being in the flower of his age, and having a very refined desire of glory, practised the ancient discipline first in his own person: his clothes and his table were according to the manners of former times; which is so much the more to be admired, because Agesistrata his mother and Archidamia his grandmother had brought him up voluptuously. When he sounded his peoples minds, he found the younger sort opposed his project less than those who had enjoyed a relaxation of discipline several years. The greatest difficulty was expected to arise from the women. They had at that time more credit than ever; for their power is never greater than when luxury is in fashion. Agesilaus's mother did not at all relish the proposed reformation. She must have lost her riches, which gave her a share in a thousand sorts of intrigues; so she opposed the design at once, and treated it as a chimera. But her brother Agesilaus, whom Agis had engaged in his interests, knew how to manage her in such a manner that she promised to second the enterprise. She endeavoured to gain the women: but instead of suffering themselves to be persuaded, they applied to Leonidas the other king of Lacedæmon, and humbly besought him to frustrate the designs of his colleague. Leonidas durst not oppose it openly, for fear of irritating the people; to whom the reformation was agreeable, because they found their account in it. He contented himself with countermining it by intrigues, and sowing suspicions as if Agis had aspired to tyranny, by pulling down the rich and raising the poor. Agis did not fail to propose his new laws to the senate, relating to the discharge of debts, and a new division of the lands. Leonidas, being supported by the rich, opposed this project so strongly, that there was one voice more against it than for it. He paid dear for the success in this affair. Lyfander, one of the Ephori, who had been the grand promoter of the reformation, called him to account; alleged the celestial signs; and put to death Cleombrotus, a prince of the royal blood and son-in-law to Leonidas, to make sure of the kingdom.

Agio.
|
Agis.

Agistment, kingdom. Leonidas being frightened at this, took refuge in a temple; whither his daughter, the wife of Cleombrotus, followed him. He was summoned; and because he did not appear, he was degraded of his dignity, which was conferred on Cleombrotus. He obtained leave to retire to Tegæa. The new Ephori had Lyfander and Mandroclidas tried for innovation: these persuaded the two kings to unite and turn out these Ephori. The thing was brought about; but not without a great uproar in the city. Agesilaus, one of the Ephori that succeeded those who were just turned out, would have caused Leonidas to be killed on the way to Tegæa, if Agis had not sent him a strong guard. The reformation might then have been established, if Agesilaus had not found means to elude the good intentions of the two kings. Whilst this was transacting, the Achæians asked assistance; which was given them, and Agis had the command of the troops. He acquired a good deal of reputation in this campaign. At his return, he found his affairs so embroiled by the ill conduct of Agesilaus, that it was impossible for him to maintain himself. Leonidas was recalled to Lacedæmon: Agis retired into one temple and Cleomenes into another. The wife of the latter behaved herself in such a manner that she became the admiration of every body. Leonidas was contented with banishing his son-in-law; after which he applied himself entirely to the ruin of Agis. One of the Ephori, who had no mind to return what Agesistrata had lent him, was the principal instrument of the misfortune of this family. Agis never went out of his sanctuary but to bathe. One day, as he was returning from thence to the temple, he was seized by that Ephorus and carried to prison. Then he was brought to his trial and condemned to death, and delivered to the executioner. His mother and grandmother used all the intreaty and importunity imaginable, that, as he was king of Lacedæmon, he might at least be permitted to plead his cause before the people. But they were apprehensive lest his words would make too great an impression, and therefore they ordered him to be strangled that very hour. The Ephorus who was in debt to Agesistrata permitted that princess to go into the prison; which he granted likewise to Agis's grandmother; but he gave orders to strangle them one after another. Agesistrata died in a manner that was extremely to her honour. The wife of Agis, who was a princess of great fortune and prudence, and one of the finest ladies in Greece, was forced away from her apartment by king Leonidas, and obliged to marry his son, who was then very young, and hardly fit for marriage.

AGISTMENT, **AGISTAGE**, or **AGISTATION**, in law, the taking in other people's cattle to graze at so much *per* week. The term is peculiarly used for the taking cattle to feed in the king's forests, as well as for the profits arising from that practice.—It is also used, in a metaphorical sense, for any tax, burden, or charge; thus, the tax levied for repairing the banks of Romney-marsh was called *agistamentum*.

AGISTOR, or **AGISTATOR**, an officer belonging to forests, who has the care of cattle taken in to be grazed, and levies the moneys due on that account. They are generally called *quest-takers* or *gift-takers*.

N° 6.

and are created by letters-patent. Each royal forest has four *agistors*.

AGISYMBBA (anc. geog.), a district of Libya Interior, according to Agathemerus, situated to the south-east of the Æthiopes Anthropophagi; the parallel passing through which, at 16° to the south of the equator, was the utmost extent of the knowledge of the ancients to the south (Ptolemy).

AGITATION, the act of shaking a body, or tossing it backwards and forwards.

AGITATION, in physics, is often used for an intestine commotion of the parts of a natural body. Fermentation and effervescence are attended with a brisk agitation of the particles.

AGITATION is one of the chief causes or instruments of mixtion: by the agitation of the parts of the blood and chyle, in their continual circulation, sanguification is in a good measure effected. Butter is made out of milk by the same means: in which operation, a separation is made of the oleous parts from the serous, and a conjunction of the oleous together. Digestion itself is only supposed to be an insensible kind of agitation.

AGITATION is reputed one of the symptoms of inspiration. Petit informs us*, that, in the last century, there arose in a church in Italy, for the space of a year, a vapour of an extraordinary kind, which put all the people into trembling and agitations, and unless they got away betimes, set them a dancing, with strange contortions and gesticulations. This seems to verify what has been related of the temple of Delphi.

AGITATION is also used in medicine for a species of exercise popularly called *swinging*. Maurice prince of Orange found this method a relief against the severe pains of the gout and stone. Bartholine mentions fits of the toothach, deafness, &c. removed by vehement agitations of the body.

AGITATOR, in antiquity, a term sometimes used for a charioteer, especially those who drove in the circus at the curule games.

AGITATORS, in the English history, certain officers set up by the army in 1647, to take care of its interests.—Cromwell joined the agitators, only with a view to serve his own ends; which being once accomplished, he found means to get them abolished.

AGLAIÀ, the name of the youngest of the three Graces, espoused to Vulcan.

AGLIONBY (John), an English divine, chaplain in ordinary to king James I. a man of universal learning, who had a very considerable hand in the translation of the New Testament appointed by king James I. in 1604.

AGMEN, in antiquity, properly denotes a Roman army in march: in which sense, it stands contradistinguished from *acies*, which denoted the army in battle array; though, on some occasions, we find the two words used indifferently for each other. The Roman armies, in their marches, were divided into *primum agmen*, answering to our vanguard; *medium agmen*, our main-battle; and *postremum agmen*, the rear-guard. The order of their march was thus: After the first signal with the trumpets, &c. the tents were taken down, and the baggage packed up; at the second signal, the baggage was to be loaden on the horses and carriages; and at the third signal, they were to begin their march.

First

agismba,
Agmen.

* Petit de
Sybilla, l. i.
Nouv. Rep.
Lett. tom.
viii. p. 113.

Agnate
||
Agnus.

First came the *extraordinarii*; then the auxiliaries of the first wing, with their baggage; these were followed by the legions. The cavalry marched either on each side or behind.

AGNATE, in law, any male relation by the father's side.

AGNEL, an ancient French gold coin, first struck under the reign of St Louis, worth about twelve sols six deniers. The agnel is also called sometimes *mouton d'or*, and *agnel d'or*. The denomination is supposed to have arisen from the figure of a lamb, agnus, or sheep, struck on one side.

AGNO, a river of Naples, which, taking its rise in the mountainous parts of Terra di Lavoro, washes the town of Acerra; and, passing between Capua and Aversa, falls into the Mediterranean, about seven miles north of Puzzuoli.

AGNOETÆ (from *αγνοεω*, to be ignorant of), in church-history, a sect of ancient heretics, who maintained that Christ, considered as to his human nature, was ignorant of certain things, and particularly of the time of the day of judgment. Eulogious, patriarch of Alexandria, ascribes this heresy to certain solitaries in the neighbourhood of Jerusalem, who built their opinion upon the text Mark xiii, 32. "Of that day and hour knoweth no man, no not the angels who are in heaven, neither the Son, but the Father only."—The same passage was made use of by the Arians; and hence the orthodox divines of those days were induced to give various explications thereof. Some allege, that our Saviour here had no regard to his divine nature, but only spoke of his human. Others understand it thus, That the knowledge of the day of judgment does not concern our Saviour considered in his quality of Messiah, but God only: which is the most natural solution.

AGNOMEN, in Roman antiquity, a kind of fourth or honorary name, given to a person on account of some extraordinary action, virtue, or other accomplishment. Thus the agnomen *Africanus* was bestowed upon Publius Cornelius Scipio, on account of his great achievements in Africa.—The agnomen was the third in order of the three Roman names: thus, in Marcus Tullius Cicero, Marcus is the prænomen, Tullius the nomen, and Cicero the agnomen.

AGNUS, or LAMB, in zoology, the young of the ovine or sheep. See Ovis.

AGNUS Castus, in botany, the trivial name of a species of the vitex. See VITEX. The Greeks call it *αγνός*, chaste; to which has since been added the reduplicative *castus*, q. d. chaste chaste. It was famous among the ancients as a specific for the preservation of chastity. The Athenian ladies, who made profession of chastity, lay upon leaves of *agnus castus* during the feasts of Ceres.—Being reputed a cooler, and particularly of the genital parts, it was anciently used in physic to allay those inordinate motions arising from seminal turgescences: but it is out of the present practice.

AGNUS Dei, in the church of Rome, a cake of wax stamped with the figure of a lamb supporting the banner of the cross. These being consecrated by the pope with great solemnity, and distributed among the people, are supposed to have great virtues; as, to preserve those who carry them worthily, and with faith,

VOL. I. Part I.

from all manner of accidents; to expel evil spirits, &c. The name literally signifies *Lamb of God*; this being supposed an image or representation of the Lamb of God who took away the sins of the world. They cover it up with a piece of stuff cut in form of a heart, and carry it very devoutly in their processions.—The Romish priests and religious derive considerable pecuniary advantage from selling these *Agnus Dei's* to some, and presenting them to others. The pope provides a regular supply, by consecrating once in seven years; they are distributed by the master of the wardrobe, and received by the cardinals and other prelates, with great reverence, in their caps and mitres.—This ceremony they pretend to derive from an ancient custom of the church, wherein part of the paschal taper consecrated on Holy Thursday was distributed among the people, to perfume their houses, fields, &c. in order to drive away devils, and to preserve them from storms and tempests. The *Agnus Dei* is forbidden to be brought into England under pain of incurring a *premunire*; 13 Eliz. cap. 2.

AGNUS Dei is also a popular name for that part of the mass wherein the priest, striking his breast three times, rehearses, with a loud voice, a prayer beginning with the words *Agnus Dei*.—The *Agnus Dei* is said to have been first brought into the missal by pope Sergius I.

AGNUS Scythicus. See *Scythian LAMB*.

AGOGÉ, among ancient musicians, a species of modulation, wherein the notes proceed by contiguous degrees.

AGON, among the ancients, implied any dispute or contest, whether it had regard to bodily exercises or the accomplishments of the mind; and therefore poets, musicians, painters, &c. had their agones, as well as the athletes. Games of this kind were celebrated at most of the heathen festivals, with great solemnity, either annually, or at certain periods of years. Among the latter were celebrated at Athens, the *agon gymnicus*, the *agon nemeus* instituted by the Argives in the 53d Olympiad, and the *agon Olympius* instituted by Hercules 430 years before the first Olympiad.—The Romans also, in imitation of the Greeks, instituted contests of this kind. The emperor Aurelian established one under the name of *agon solis*, the contest of the sun; Dioclesian another, which he called *agon capitolinus*, which was celebrated every fourth year, after the manner of the Olympic games. Hence the years, instead of *lustra*, are sometimes numbered by *agones*.

AGON also signified one of the ministers employed in the Heathen sacrifices, and whose business it was to strike the victim. The name is supposed to have been derived from hence, that standing ready to give the stroke he asked, *Agon?* or *Agone?* Shall I strike?

AGONALES, an epithet given to the SALII.

AGONALIA, in Roman antiquity, festivals celebrated in honour of Janus, or the god Agonius, whom the Romans invoked before undertaking any affair of importance.

AGONALIS circus, now *La Piazza Navona*, a long, large, beautiful street in the heart of Rome, adorned with fountains, and the obelisk of Caracalla, still retaining the form of that circus. The reason of the name *Agonalis* is either unknown or doubtful. Ovid seems to derive it from the *agones*, or solemn games,

H h there

Agnus
||
Agonalis.

Agonisma there celebrated; supposed to have been the *Ludi Apollinares*, or *Atliaci*, instituted by Augustus: whence the circus was called *Apollinaris*; also *Alexandrinus*, from the emperor Alexander Severus, who either enclosed or repaired the circus.

AGONISMA, in antiquity, denotes the prize given to the victor in any combat or dispute.

AGONISTARCHA, from *αγων* "combat," and *αρχος* "chief," in antiquity, seems to have been much the same with *agonotheta*; though some suggest a difference, making it the office of the former to preside at and direct the private exercises of the *athletæ*, which they went through by way or practice, before they made their appearance on the public theatres or amphitheatres.

AGONISTICI, in church-history, a name given by Donatus to such of his disciples as he sent to fairs, markets, and other public places, to propagate his doctrine; for which reason they were also called *Circuitores*, *Circelliones*, *Catropita*, *Coropita*, and at Rome *Montenses*. They were called *Agonistici*, from the Greek *αγων*, "combat," in regard they were sent as it were to fight and subdue the people to their opinions.

AGONIUM, in Roman antiquity, was used for the day on which the *rex sacrorum* sacrificed a victim, as well as for the place where the games were celebrated, otherwise called *agon*.

AGONOTHETA, or AGONOTHETES, in Grecian antiquity, was the president or superintendant of the sacred games; who not only defrayed the expences attending them, but inspected the manners and discipline of the *athletæ*, and adjudged the prizes to the victors.

AGONY, any extreme pain. It is also used for the pangs of death. Much of the terror of death consists in the pangs and convulsions wherewith the agony seems attended; tho' we have reason to believe that the pain in such cases is ordinarily not extremely acute; a course of pain and sickness having usually stupified and indisposed the nerves for any quick sensations. However, various means have been thought of for mitigating the agony of death. Lord Bacon considers this as part of the province of a physician; and that not only when such a mitigation may tend to a recovery, but also when, there being no further hopes of a recovery, it can only tend to make the passage out of life more calm and easy. Complacency in death, which Augustus so much desired, is certainly no small part of happiness. Accordingly the author last cited ranks *euthanasia*, or the art of dying easily, among the desiderata of science; and does not even seem to disapprove of the course Epicurus took for that end.

—*Hinc stygiæ ebrius hausit aquas.*

Opium has been applied for this purpose, with the applause of some, but the condemnation of more.

AGONYCLITÆ, or AGONYCLITES, in church-history, a sect of Christians, in the 7th century, who prayed always standing, as thinking it unlawful to kneel.

AGORÆUS, in heathen antiquity, an appellation given to such dieties as had statues in the market-places; particularly Mercury, whose statue was to be seen in almost every public place.

AGORANOMUS, in Grecian antiquity, a magistrate of Athens, who had the regulation of weights and measures, the prices of provisions, &c.—The *ago-*

ranomi, at Athens, were ten in number, five belonging to the city, and as many to the Piræus; though others make them fifteen in all, of whom they assign ten to the city. To these a certain toll or tribute was paid by all who brought any thing to sell in the market.

AGOUTI, or AGUTI. See Mus.

AGRA, the capital town of a province of the same name, in Indostan, and in the dominions of the Great Mogul. It is looked upon as the largest city in these parts, and is in the form of a half-moon. A man on horseback can hardly ride round it in a day. It is surrounded with a wall of red stone, and with a ditch 100 feet wide. The palace is prodigiously large, and the seraglio commonly contains above 1000 women. There are upwards of 800 baths in this town; but that which travellers most admire, is the mausoleum of one of the Mogul's wives, which was 20 years in building. The indigo of Agra is the most valuable of all that comes from the East Indies. This town is seated on the river Jemma, about 50 miles above its confluence with the Tehemel, and is 300 miles N. E. of Surat. E Long. 79. 12. N. Lat. 26. 29.

AGRARIAN LAWS, among the Romans, those relating to the division and distribution of lands; of which there were a great number; but that called the *Agrarian Law*, by way of eminence, was published by Spurius Cassius, about the year of Rome 268, for dividing the conquered lands equally among all the citizens, and limiting the number of acres which each citizen might enjoy.—The Roman lands were of several kinds; some conquered from the enemies, and not yet brought to the public account; others brought indeed to the public, but clandestinely usurped by private great men; lastly, others purchased with the public money, in order to be divided. Agrarian laws, either for dividing lands taken from the enemy, or the public lands, or those purchased with the public money, were easily passed without disturbance; but those whereby private rich men were to be deprived of their lands, and the common people put in possession of what had been held by the nobility, were never attempted without great disturbances.

Several have pleaded for the necessity of agrarian laws among us: but no author has entered so deeply into the subject as Mr Harrington in his *Oceana*; which the reader who chooses may consult.

AGREDA, a town of Spain, in Old Castile, near the frontiers of Arragon, and about three leagues south-west of Tarazon.

AGRIA, called by the Germans *Eger*, is a small but strong town in Upper Hungary, and is a bishop's see. It is situated on a river of the same name, and has a citadel called *Eriaw*. It was besieged by the Turks in 1552, with 70,000 men: but they lost 8000 in one day; and were obliged to raise the siege, though the garrison consisted only of 2000 Hungarians, assisted by the women, who performed wonders on this occasion. However, it was afterwards taken by Mahomet III. in 1596; but was retaken by the emperor in 1687; since which time it has continued under the dominion of the house of Austria. It is 47 miles north-east of Buda, and 55 south-west of Cassovia. E Long. 20. 10. N. Lat. 48. 10.

AGRICOLA (Cneus Junius), born at Frejus in Pro-

Agouti
Agricola.

Agricola. Provençe, was, in Vespasian's time, made lieutenant to Vettius Bolanus in Britain; and, upon his return, was ranked by that emperor among the patricians, and made governor of Aquitania. This post he held three years; and upon his return was chosen counsel, and afterward appointed governor of Britain, where he greatly distinguished himself. He reformed many abuses occasioned by the avarice or negligence of former governors, put a stop to extortion, and caused justice to be impartially administered. Vespasian dying about this time, his son Titus, knowing the great merit of Agricola, continued him in the government. In the spring, he marched towards the north, where he made some new conquests, and ordered forts to be built for the Romans to winter in. He spent the following winter in concerting schemes to bring the Britons to conform to the Roman customs. He thought the best way of diverting them from rising and taking arms, was to soften their rough manners, by proposing to them new kinds of pleasure, and inspiring them with a desire of imitating the Roman manners. Soon after this, the country was adorned with magnificent temples, porticos, baths, and many other fine buildings. The British nobles had at length their sons educated in learning; and they who before had the utmost aversion to the Roman language, now began to study it with great assiduity: they wore likewise the Roman habit; and, as Tacitus observes, they were brought to consider those things as marks of politeness, which were only so many badges of slavery. Agricola, in his third campaign, advanced as far as the Tweed; and in his fourth, he subdued the nations betwixt the Tweed and the friths of Edinburgh and Dumbrifton, into which the rivers Glotta and Bodotria discharge themselves; and here he built fortresses to shut up the nations yet unconquered. In his fifth, he marched beyond the friths; where he made some new acquisitions, and fixed garrisons along the western coasts, over against Ireland. In his sixth campaign he passed the river Bodotria, ordering his fleet, the first which the Romans ever had in those parts, to row along the coasts, and take a view of the northern parts. In the following spring, the Britains raised an army of 30,000 men; and the command was given to Galgacus, who, according to Tacitus, made an excellent speech to his countrymen on this occasion. Agricola likewise addressed his men in very strong and eloquent terms. The Romans gained the victory, and 10,000 of the Britains are said to have been killed. This happened in the reign of the emperor Domitian; who, growing jealous of the glory of Agricola, recalled him, under pretence of making him governor of Syria. Agricola died soon after; and his death is suspected to have been occasioned by poison given him by that emperor. Tacitus the historian married his daughter, wrote his life, and laments his death in the most pathetic manner.

AGRICOLA (George), a German physician, famous for his skill in metals. He was born at Glaucha, in Misnia, the 24th of March 1494. The discoveries which he made in the mountains of Bohemia, gave him so great a desire of examining accurately into every thing relating to metals, that though he had engaged in the practice of physic at Joachimsthal by advice of his friends, he still prosecuted his study of fossils with great assiduity; and at length removed to Chemnitz, where he entirely devoted himself to this study. He spent in pursuit of it the pension he had of Maurice duke of Saxony, and part of his own estate; so that he reaped more reputation than profit from his labours. He wrote several pieces upon this and other subjects; and died at Chemnitz the 21st of November 1555, a very firm Papist. In his younger years he seemed not averse to the Protestant doctrine; and he highly disapproved of the scandalous traffic of indulgences, and several other things in the church of Rome. The following lines of his were posted up in the streets of Zwicka, in the year 1719:

*Si nos injecto salvebit cistula nummo,
Heu nimium infelix tu mihi, pauper, eris!
Si nos, Christe, tua servatos morte beasti,
Tam nihil infelix tu mihi, pauper, eris.*

If wealth alone salvation can procure,
How sad a state for ever waits the poor!
But if thou, Christ, our only saviour be,
Thy merits still may bless ev'n poverty!

In the latter part of his life, however, he had attacked the Protestant religion: which rendered him so odious to the Lutherans, that they suffered his body to remain unburied for five days together; so that it was obliged to be removed from Chemnitz to Zeitz, where it was interred in the principal church.

AGRICOLA (John), a Saxon divine born at Islebe in 1492. He went as chaplain to count Mansfield, when that nobleman attended the Elector of Saxony to the diet of Spire in 1526, and that of Ausburg in 1530. He was of a restless ambitious temper, rivalled and wrote against Melancthon, and gave count Mansfield occasion to reproach him severely. He obtained a professorship at Wittemberg, where he taught particular doctrines, and became founder of the sect of Antinomians; which occasioned warm disputes between him and Luther, who had before been his very good friend. But though he was never able to recover the favour either of the elector of Saxony or of Luther, he received some consolation from the fame he acquired at Berlin: where he became preacher at court; and was chosen in 1548, in conjunction with Julius Phlug and Michael Heldingus, to compose the famous *Interim*, which made so much noise in the world. He died at Berlin in 1566.

A G R I C U L T U R E

Definition.

MAY be defined, The art of disposing the earth in such a manner as to produce whatever vegetables we desire, in large quantity, and in the greatest perfection of which their natures are capable.—But though, by this definition, agriculture, strictly speaking, includes in it the cultivation of every species of vegetable whatever, and consequently comprehends all that is understood of gardening and planting, we mean here to confine

fine ourselves to the cultivation of those species of grain, grafs, &c. which, in this country, are generally necessary as food for men and beasts.

HISTORY. THE antiquity of this art is undoubtedly beyond that of all others; for we are informed by Scripture, that Adam was sent from the garden of Eden *to till the ground*; and, this being the case, he certainly must have known how to do so.—It would be ridiculous, however, to imagine that he was acquainted with all the methods of ploughing, harrowing, fallowing, &c. which are now made use of; and it would be equally so to suppose, that he used such clumsy and unartful instruments as wooden hooks, horns of oxen, &c. to dig the ground, which were afterwards employed for this purpose by certain savages: but as we know nothing of the particular circumstances in which he was situated, we can know as little concerning his method of agriculture.

The prodigious length of life which the antediluvians enjoyed, must have been very favourable to the advancement of arts and sciences, especially agriculture, to which it behoved them to apply themselves in a particular manner, in order to procure their subsistence. It is probable, therefore, that, even in the antediluvian world, arts and sciences had made great progress, nay, might be farther advanced in some respects than they are at present. Of this, however, we can form no judgment, as there are no histories of those times, and the scripture give us but very slight hints concerning these matters.

No doubt, by the terrible catastrophe of the flood, which overwhelmed the whole world, many sciences would be entirely lost, and agriculture would suffer; as it was impossible that Noah or his children could put in practice, or perhaps know, all the different methods of cultivating the ground that were formerly used. The common methods, however, we cannot but suppose to have been known to him and his children, and by them transmitted to their posterity: so that as long as mankind continued in one body without being dispersed into different nations, the arts, agriculture especially, would necessarily advance; and that they did so, is evident from the undertaking of the tower of Babel. It is from the dispersion of mankind consequent upon the confusion of tongues, that we must date the origin of savage nations. In all societies where different arts are cultivated, there are some persons who have a kind of general knowledge of most of those practised through the whole society, while others are in a manner ignorant of every one of them. If we suppose a few people of understanding to separate from the rest, and become the founders of a nation, it will probably be a civilized one, and the arts will begin to flourish from its very origin; but, if a nation is founded by others whose intellects are in a manner callous to every human science (and of this kind there are many in the most learned countries), the little knowledge or memory of arts that were among the original founders will be lost, and such a people will continue in a state of barbarism for many ages, unless the arts be brought to them from other nations.

From this, or similar causes, all nations of equal antiquity have not been equally savage, nor is there any solid reason for concluding that all nations were origi-

nally unskilled in agriculture; though as we know not the original instruments of husbandry used by mankind when living in one society, we cannot fix the date of the improvements in this art. Different nations have always been in a different state of civilization; and agriculture, as well as other arts, has always been in different degrees of improvement among different nations at the same time.

From the earliest accounts of the eastern nations, we have reason to think, that agriculture has at all times been understood by them in considerable perfection; seeing they were always supplied not only with the necessities, but the greatest luxuries of life.

As soon as the descendants of Abraham were settled in Palestine, they generally became husbandmen, from the chiefs of the tribe of Judah to the lowest branch of the family of Benjamin. High birth or rank did not at that time make any distinction, for agriculture was considered as the most honourable of all employments; witness the illustrious examples of Gideon, Saul, and David.

The Chaldeans, who inhabited the country where agriculture had its birth, carried that valuable art to a degree of excellence unknown in former times. They cultivated their lands with great assiduity, and seem to have found out some means of restoring fertility to an exhausted soil, by having plentiful harvests in succession; on which account they were not obliged, as their predecessors had been, to change their situations, in order to obtain a sufficiency for themselves and their numerous flocks and herds.

The Egyptians, who, from the natural fertility of their country by the overflowing of the Nile, raised every year vast quantities of corn, were so sensible of the blessings resulting from agriculture, that they ascribed the invention of that art to Osiris. They also regarded Isis, their second deity, as the discoverer of the use of wheat and barley, which before grew wild in the fields, and were not applied by that people to the purposes of food. Their superstitious gratitude was carried so far, as to worship those animals which were employed in tillage; and even to the produce of their lands, as leeks, onions, &c.

The divine honours paid to Bacchus in India were derived from the same source, he being considered in that country as the inventor of planting vineyards, and the other arts attendant upon agriculture.

It is also related of the ancient Persians, on the most respectable authority, that their kings laid aside their grandeur once every month to eat with husbandmen. This is a striking instance of the high estimation in which they held agriculture; for at that time arts were practised among that people in great perfection, particularly those of weaving, needle-work, and embroidery. The precepts of the religion taught by their ancient magi, or priests, included the practice of agriculture. The *saint* among them was obliged to work out his salvation by pursuing all the labours of agriculture: And it was a maxim of the Zendavesta, that he who sows the ground with care and diligence, acquires a greater degree of religious merit, than he could have gained by the repetition of ten thousand prayers.

The Phenicians, so well known in scripture by the name of *Philistines*, were also remarkable for their attention to, and skill in agriculture. But finding them-

selves

selves too much disturbed and confined by the incursions and conquests of the Israelites, they spread themselves throughout the greatest part of the Mediterranean islands, and carried with them their knowledge in the arts of cultivation.

Mago, a famous general of the Carthaginians, is said to have written no less than 28 books on the subject; which Columella tells us were translated into Latin by the express order of the Roman senate. We are informed by the ancient writers, that Ceres was born in Sicily, where she first invented the arts of tillage and of sowing corn. For this essential service, she was, agreeably to the superstition of those ages, deified, and worshipped as the goddess of plenty. The truth of this is, that in the time of Ceres, the island, through her endeavours and the industry of the people, became very fruitful in corn; and agriculture was there esteemed so honourable an employment, that even their kings did not disdain to practise it with their own hands.

But time, which at first gave birth to arts, often caused them to be forgotten when they were removed from the place of their origin. The descendants of Noah, who settled in Europe, doubtless carried their knowledge of agriculture with them into the regions which they successively occupied. But those who took possession of Greece were such an uncivilized race, that they fed on roots, herbs, and acorns, after the manner of beasts. Pelasgus had taught them the culture of the oak, and the use of acorns as food; for which service, we are told, divine honours were paid him by the people.

The Athenians, who were the first people that acquired any tincture of politeness, taught the use of corn to the rest of the Greeks. They also instructed them how to cultivate the ground, and to prepare it for the reception of the seed. This art, we are told, was taught them by Triptolemus. The Greeks soon perceived that bread was more wholesome, and its taste more delicate, than that of acorns and the wild roots of the fields; accordingly they thanked the gods for such an unexpected and beneficial present, and honoured their benefactor.

As the arts of cultivation increased, and the blessings they afforded became generally experienced, the people soon preferred them to whatever the ravages of conquest, and the cruel depredations of savage life, could procure. And accordingly we find, that the Athenian kings, thinking it more glorious to govern a small state wisely, than to aggrandize themselves, and enlarge the extent of their dominions by foreign conquests, withdrew their subjects from war, and mostly employed them in cultivating the earth. Thus, by continued application, they brought agriculture to a considerable degree of perfection, and soon reduced it to an art.

Hesiod was the first we know of among the Greeks who wrote on this interesting subject. According to the custom of the Oriental authors, he wrote in poetry, and embellished his poem with luxuriant description and sublime imagery. He calls his poem *Weeks and Days*, because agriculture requires exact observations on times and seasons.

Xenophon has also, in his *Oeconomics*, remarked, that agriculture is the nursing mother of the arts. For, says he, "where agriculture succeeds prosperously,

there the arts thrive; but where the earth necessarily lies uncultivated, there the other arts are destroyed."

Other eminent Greek writers upon agriculture were, Democritus of Abdera, Socraticus, Archytas, Tarentinus, Aristotle, and Theophrastus, from whom the art received considerable improvements.

The ancient Romans esteemed agriculture so honourable an employment, that the most illustrious senators of the empire, in the intervals of public concerns, applied themselves to this profession; and such was the simplicity of those ages, that they assumed no appearance of magnificence and splendor, or of majesty, but when they appeared in public. At their return from the toils of war, the taking of cities, and the subduing of hostile nations, their greatest generals were impatient till they were again employed in the arts of cultivation.

Regulus, when in Africa, requested of the senate to be recalled, lest his farm might suffer, for want of proper cultivation, in his absence; and the senate wrote him for answer, that it should be taken care of at the public expence, while he continued to lead their armies.

Cato the censor, after having governed extensive provinces, and subdued many warlike nations, did not think it below his dignity to write a Treatise on Agriculture. This work (as we are told by Servius) he dedicated to his own son, it being the first Latin treatise written on this important subject; and it has been handed down to us in all its purity, in the manner that Cato wrote it.

Varro composed a treatise on the same subject, and on a more regular plan. This work is embellished with all the Greek and Latin erudition of that learned author, who died 28 years before the commencement of the Christian æra. Virgil, who lived about the same time, has, in his *Georgics*, adorned this subject with the language of the Muses, and finely illustrated the precepts and rules of husbandry left by Hesiod, Mago, and Varro.

Columella, who flourished in the reign of the emperor Claudius, wrote 12 books on husbandry, replete with important instruction.

From this period to that of the reign of Constantine Paganatus, husbandry continued in a declining state; but that wise emperor caused a large collection of the most useful precepts relating to agriculture to be extracted from the best writers, and published them under the title of *Geoponics*. It has been asserted, that he made this collection with his own hand; and the truth of the assertion is not improbable, as it is well known, that after he had conquered the Saracens and the Arabians, he not only practised and encouraged, but studied the arts of peace, fixing his principal attention on agriculture, as their best foundation.

After the death of Constantine, however, the increasing attention of the people to commerce, and the ignorance and gross superstition of the ages which succeeded, seems to have rendered agriculture an almost neglected science. The irruptions of the northern nations soon abolished any improved system. These innumerable and enterprising barbarians, who over-ran all Europe, were originally shepherds or hunters, like the present Tartars and the savages of America. They contented themselves with possessing those vast deserts made

by

by their own ravages, without labour or trouble, cultivating only a very small spot near their habitations; and in this trifling husbandry only the meanest slaves were employed: so that the art itself, which formerly was thought worthy of the study of kings, was now looked upon as mean and ignoble; a prejudice which is scarcely effaced at present, or at least but very lately. —During this period, therefore, we find no vestiges of any thing tolerably written on the subject. No new attempts were made to revive it, or to improve it, till the year 1478, when Crescenzo published an excellent performance on the subject at Florence. This roused the slumbering attention of his countrymen, several of whom soon followed his example. Among these, Tatti, Steffano Augustino Gallo, Sansovino, Lauro, and Tarello, deserve particular notice.

At what time agriculture was introduced into Britain, is uncertain. When Julius Cæsar first invaded this island, it was not wholly unknown. That conqueror was of opinion, that agriculture was first introduced by some of those colonies from Gaul which had settled in the southern parts of Britain, about 100 years before the Roman invasion*.

* Cæsar de
Bell. Gall.
lib. 5. c. 12.

† Plin. Nat.
Hist. lib. 17.
cap. 6.

It is not to be expected that we can now be acquainted with many of the practices of these ancient husbandmen. It appears, however, that they were not unacquainted with the use of manures, particularly marl. This we have on the authority of Pliny†, who tells us, that it was peculiar to the people of Gaul and of Britain; that its effects continued 80 years; and that no man was ever known to marl his field twice, &c.—It is highly probable, too, that lime was at this time also used as a manure in Britain, it being certainly made use of in Gaul for this purpose at the time of Julius Cæsar's invasion.

The establishment of the Romans in Britain produced great improvements in agriculture, insomuch that prodigious quantities of corn were annually exported from the island; but when the Roman power began to decline, this, like all the other arts, declined also, and was almost totally destroyed by the departure of that people. The unhappy Britons were now exposed to frequent incursions of the Scots and Picts, who destroyed the fruits of their labours, and interrupted them in the exercise of their art. After the arrival of the Saxons in the year 449, they were involved in such long wars, and underwent so many calamities, that the husbandmen gradually lost much of their skill, and were at last driven from those parts of their country which were most proper for cultivation.

After the Britons retired into Wales, though it appears from the laws made relative to this art, that agriculture was thought worthy of the attention of the legislature, yet their instruments appear to have been very unartful. It was enacted that no man should undertake to guide a plough who could not make one; and that the driver should make the ropes of twisted willows, with which it was drawn. It was usual for six or eight persons to form themselves into a society for fitting out one of these ploughs, providing it with oxen and every thing necessary for ploughing; and many minute and curious laws were made for the regulation of such societies. If any person laid dung on a field with the consent of the proprietor, he was by law allowed the use of that land for one year. If the dung was carried

out in a cart in great abundance, he was to have the use of the land for three years. Whoever cut down a wood, and converted the ground into arable, with the consent of the owner, was to have the use of it for five years. If any one folded his cattle, for one year, upon a piece of ground belonging to another, with the owner's consent, he was allowed the use of that field for four years.

Thus, though the Britons had in a great measure lost the knowledge of agriculture, they appear to have been very assiduous in giving encouragement to such as would attempt a revival of it; but, among the Anglo-Saxons, things were not at present in so good a state. These restless and haughty warriors, having contracted a distaste and contempt for agriculture, were at pains to enact laws to prevent its being followed by any other than women and slaves. When they first arrived in Britain, they had no occasion for this art, being supplied by the natives with all the necessaries of life. After the commencement of hostilities, the Saxons subsisted chiefly by plunder: but having driven out or extirpated most of the ancient Britons, and divided their lands among themselves, they found themselves in danger of starving, there being now no enemy to plunder; and therefore they were obliged to apply to agriculture.

The Saxon princes and great men, who, in the division of the lands, had received the greatest shares, are said to have subdivided their estates into two parts, which were called the *in-lands* and the *out-lands*. The *in-lands* were those which lay most contiguous to the mansion-house of their owner, which he kept in his own possession, and cultivated by his slaves, under the direction of a bailiff, for the purpose of raising provisions for the family. The *out-lands* were those at a greater distance from the house, and were let to the *ceorls*, or farmers of those times, at very moderate rents. By the laws of Ina king of the West Saxons, who reigned in the end of the seventh and beginning of the eighth century, a farm consisting of ten hides, or plough-lands, was to pay the following rent: "Ten casks of honey; three hundred loaves of bread; twelve casks of strong ale; thirty casks of small ale; two oxen; ten wedders; ten geese; twenty hens; ten cheeses; one cask of butter; five salmon; twenty pounds of forage; and one hundred eels." From this low rent, the imperfection of agriculture at that time is easily discoverable; but it is still more so from the low prices at which land was then sold. In the ancient history of the church of Ely, published by Dr Gale, there are accounts of many purchases of lands by Ædelwold the founder of that church, and by other benefactors, in the reign of Edgar the Peaceable, in the tenth century. By a comparison of these accounts it appears, that the ordinary price of an acre of the best land in that part of England, in those times, was no more than 16 Saxon pennies, or about four shillings of our money: a very trifling price, even in comparison with that of other commodities at the same time: for, by comparing other accounts, it appears, that four sheep were then equal in value to an acre of the best land, and one horse of the same value with three acres. The frequent and deplorable famines which afflicted England about this time, are further instances of the wretched state of agriculture. In 1043, a quarter of wheat sold for

for 60 Saxon pennies (15 of our shillings), and at that time equal in value to seven or eight pounds of our money now.

The invasion of the Normans, in 1066, contributed very much to the improvement of agriculture; for, by that event, many thousands of husbandmen from Flanders, France, and Normandy, settled in Britain, obtained estates or farms, and cultivated them after the manner of their country. The implements of husbandry, used at this time, were of the same kind with those employed at present; but some of them were less perfect in their construction. The plough, for example, had but one stilt or handle, which the ploughman guided with one hand, having in his other hand an instrument which served both for cleaning and mending the plough, as well as for breaking the clods. The Norman plough had two wheels; and in the light soil of Normandy was commonly drawn by one or two oxen; but, in England, a greater number was often necessary. In Wales, the person who conducted the oxen in the plough walked backwards. Their carts, harrows, scythes, sickles, and flails, from the figures of them still remaining, appear to have been nearly of the same construction with those that are now used. In Wales, they did not use a sickle for reaping their corns, but an instrument like the blade of a knife, with a wooden handle at each end.—Their chief manure, next to dung, seems still to have been marl. Summer fallowing of lands designed for wheat, and ploughing them several times, appear to have been frequent practices of the English farmers in this period.

We are, after all, very much in the dark with respect to the state and progress of agriculture in Great Britain previous to the fourteenth century. That it was pretty generally practised, especially in the eastern, south, and midland parts of England, is certain; but of the mode, and the success, we are left almost totally ignorant. In the latter end of the fifteenth century, however, it seems to have been cultivated as a science, and received very great improvement.

At this time our countryman Fitzherbert, Judge of the Common-Pleas, shone forth with distinguished eminence in the practical parts of husbandry. He appears to have been the first Englishman who studied the nature of soils and the laws of vegetation with philosophical attention. On these he formed a theory confirmed by experiments, and rendered the study pleasing as well as profitable, by realizing the principles of the ancients, to the honour and advantage of his country. Accordingly, he published two treatises on this subject: the first, intitled *The Book of Husbandry*, appeared 1534; and the second, called *The Book of Surveying and Improvements*, in 1539. These books, being written at a time when philosophy and science were but just emerging from that gloom in which they had long been buried, were doubtless replete with many errors; but they continued the rudiments of true knowledge, and revived the study and love of an art, the advantages of which were obvious to men of the least reflection. We therefore find that Fitzherbert's books on agriculture soon raised a spirit of emulation in his countrymen, and many treatises of the same kind successively appeared, which time has however deprived us of, or at least they are become so very scarce as only to be found in the libraries of the curious.

About the year 1600, France made some considerable efforts to revive the arts of husbandry, as appears from several large works, particularly *Les Moyens de devenir Riche*; and the *Cosmopolite*, by Bernard de Palissy, a poor porter, who seems to have been placed by fortune in a station for which nature never intended him; *Le Theatre d'Agriculture*, by Defferes; and *L'Agriculture et Maison Rustique*, by Messrs Etienne, Liebault, &c.

Nearly in the same period, the practice of husbandry became more prevalent among this people and the Flemings than the publishing of books on the subject. Their intention seemed to be that of carrying on a private lucrative employment, without instructing their neighbours. Whoever therefore became desirous of copying their method of agriculture, was obliged to visit that country, and make his own remarks on their practice.

The principal idea they had of husbandry was, by keeping the lands clean and in fine tilth, to make a farm resemble a garden as nearly as possible.

Such an excellent principle, at first setting out, led them of course to undertake the culture of small farms only, which they kept free from weeds, continually turning the ground, and manuring it plentifully and judiciously. When they had by this method brought the soil to a proper degree of cleanliness, health, and sweetness, they chiefly cultivated the more delicate grasses, as the surest means of obtaining a certain profit upon a small estate, without the expence of keeping many draught horses and servants. A few years experience was sufficient to convince them, that ten acres of the best vegetables for feeding cattle, properly cultivated, would maintain a larger stock of grazing animals than forty acres of common farm grass on land badly cultivated. They also found, that the best vegetables for this purpose were lucerne, saintfoin, trefoil of most kinds, field-turnips, &c.

The grand political secret of their husbandry, therefore, consisted in letting farms on improvement. They are said also to have discovered nine sorts of manure; but what they all were, we are not particularly informed. We find, however, that marl was one of them; the use and virtues of which appear also to have been well known in this kingdom two hundred years ago, although it was afterwards much neglected. They were the first people among the moderns who ploughed in green crops for the sake of fertilizing the soil; and who confined their sheep at night in large sheds built on purpose, the floors of which were covered with sand or virgin earth, &c. which the shepherd carted away each morning to the compost dunghill.

In England, during the civil wars, though the operations and improvements in husbandry suffered some temporary checks, there flourished several excellent writers on the subject, and the art itself received considerable encouragement. Sir Hugh Platt was one of the most ingenious husbandmen of the age in which he lived; yet so great was his modesty, that all his works, except his *Paradise of Flora*, seem to be posthumous. He held a correspondence with most of the lovers and patrons of agriculture and gardening in England; and such was the justice and modesty of his temper, that he always named the author of every discovery communicated to him. Perhaps no man in any age discovered, or at least

least

least brought into use, so many new kinds of manure. This will be evident to those who read his account of the compost and covered dung-hills, and his judicious observations on the fertilizing qualities lodged in salt, street-dirt, and the fullage of streets in great cities, clay, fuller's earth, moorish earths, dung-hills made in layers, fern, hair, calcination of all vegetables, malt-dust, willow-tree earth, soaper's ashes, urine, marl, and broken pilchards.

Gabriel Plattes may be said to have been an original genius in husbandry. He began his observations at an earlier period, in the reign of Queen Elizabeth, and continued them down to the Commonwealth. But notwithstanding the great merit of this writer, and the essential service he had rendered his country by his writings, the public ungratefully suffered him to starve and perish in the streets of London; nor had he a shirt on his back when he died.

Samuel Hartlib, a celebrated writer on agriculture in the last century, was highly esteemed and beloved by Milton, and other great men of his time. In the preface to his work intitled *His Legacy*, he laments that no public director of husbandry was established in England by authority; and that we had not adopted the Flemish method of letting farms upon improvement. This remark of Hartlib's procured him a pension of L. 100 a-year from Cromwell; and the writer afterwards, the better to fulfil the intention of his benefactor, procured Dr Beatti's excellent annotation on the *Legacy*, with other valuable papers from his numerous correspondents.

The time in which Hartlib flourished seems to have been an æra when the English husbandry rose to great perfection, compared with that of former ages; for the preceding wars had impoverished the country gentlemen, and of course made them industrious. They found the cultivation of their own lands to be the most profitable station they could fill. But this wise turn was not of long continuance. At the Restoration, they generally became infected with that intoxication and love of pleasure which succeeded. All their industry and knowledge were exchanged for neglect and dissipation; and husbandry descended almost entirely into the hands of common farmers.

Evelyn was the first writer who inspired his countrymen with a desire of reviving the study of agriculture; and he was followed by the famous Jethro Tull. The former, by his admirable treatises on earth and on planting, and the latter, by showing the superior advantages of the drill-husbandry, excited numbers to bring their theory to the test of fair experiment.

Many valuable and capital improvements have since that period been made in English husbandry: and these great men have been succeeded by a variety of writers, many of whom have done essential service, by enlightening the minds of their countrymen, and exciting them to emulation.

About the middle of the last century, Ireland began to make a considerable figure in the art of husbandry. It must indeed be confessed, that the Irish had very strong prejudices in favour of a wretched method of agriculture, till Blyth opened their eyes by his excellent writings. Since that time, a spirit of improvement has more or less been promoted, and in many instances carried on with great zeal, by the

Nº 7.

nobility, clergy, and gentry of that kingdom. In proof of this, it will be sufficient to observe, that the Transactions of the Dublin Society for encouraging Husbandry are now cited by all foreigners in their memoirs relating to that subject. And the observations of that discerning and judicious writer, Arthur Young, Esq; in his late Tour through that kingdom, show, that in many respects improvements there have of late years made a progress nearly as rapid as in England.

After the peace of Aix-la-Chapelle, most of the nations of Europe, by a sort of tacit consent, applied themselves to the study of agriculture, and continued to do so, more or less, amidst the universal confusion that succeeded.

The French found, by repeated experience, that they could never maintain a long war, or procure a tolerable peace, unless they could raise corn enough to support themselves in such a manner as not to be obliged to harsh terms on the one hand, or to perish by famine on the other. This occasioned the king to give public encouragement to agriculture, and even to be present at the making of several experiments. The great, and the rich of various ranks and stations, followed his example; and even the ladies were candidates for a share of fame in this public-spirited and commendable undertaking.

During the hurry and distresses of France in the war of 1756, considerable attention was paid to agriculture. Prize-questions were annually proposed in their rural academies, particularly those of Lyons and Bourdeaux; and many judicious observations were made by the Society for improving agriculture in Brittany.

Since the conclusion of that war in 1763, matters have been carried on there with great vigour. The university of Amiens made various proposals for the advancement of husbandry; and the Marquis de Tourbilly (a writer who proceeded chiefly on experience) had the principal direction of a Georgical society established at Tours.

The society at Rouen also deserves notice; nor have the king and his ministers thought it unworthy their attention. There are at present about fifteen societies existing in France, established by royal approbation, for the promoting of agriculture; and these have twenty co-operating societies belonging to them.

About this time vigorous exertions began to be made in Russia to introduce the most approved system of husbandry which had taken place in other parts of Europe. The present empress has sent several gentlemen into Britain and other countries to study agriculture, and is giving it all possible encouragement in her own dominions.

The art of agriculture has also been for near 30 years publicly taught in the Swedish, Danish, and German universities, where the professors may render effectual service to their respective countries, if they understand the practical as well as the speculative part, and can converse with as much advantage with the farmer as with Virgil and Columella.

Even Italy has not been totally inactive. The Neapolitans of this age have condescended to recur to the first rudiments of revived husbandry, and begun to study anew the Agricultural System of Crescenzo, first published in 1478. The people of Bergamo have pursued

sued the same plan, and given a new edition of the *Ricordo d'Agricoltura de Tarello*, first published in 1577. The dutchy of Tuscany have imbibed the same spirit for improvement. A private gentleman, above 40 years since, left his whole fortune to endow an academy of agriculture. The first ecclesiastic in the dutchy is president of this society, and many of the chief nobility are members.

His Sardinian Majesty has also sent persons to learn the different modes of practice in foreign countries; and made some spirited attempts to establish a better method of agriculture among his subjects.

In Poland, also, M. De Bieluski, grand marshal of the crown, has made many successful attempts to introduce the new husbandry among his countrymen; and procured the best instruments for that purpose from France, England, and other parts of Europe.

The Hollanders are the only people now in Europe who seem to look upon agriculture with indifference. Except the single collateral instance of draining their fens and morasses, they have scarcely paid any attention to it; and even this seems to have proceeded more from the motive of self-preservation than any love of, or disposition to, husbandry.

In the year 1759, a few ingenious and public-spirited men at Berne in Switzerland established a society for the advancement of agriculture and rural æconomics. In that society were many men of great weight in the republic, and most of them persons of a true cast for making improvements in husbandry, being enabled to join the practice with the theory.

Nor must we here omit to mention, that the justly celebrated Linnæus and his disciples have performed great things in the north of Europe, particularly in discovering new kinds of profitable and well-tasted food for cattle. About the same time, Sweden bestowed successful labours on a soil which had before been looked upon as cold, barren, and incapable of melioration. Of this the Stockholm Memoirs will be a lasting monument.

Denmark, and many of the courts in Germany, followed the same example. Woollen manufactures were encouraged, and his Danish Majesty sent three persons into Arabia Felix to make remarks, and bring over such plants and trees as would be useful in husbandry, building, and rural affairs.

The duchy of Wirtemburgh, also, a country by no means unfertile, but even friendly to corn and pasturage, has contributed its assistance towards the improvement of agriculture, having more than 30 years since published 14 æconomical relations at Stutgard.

Nither must we forget the very assiduous attention

of the learned in Leipzig and Hanover to this important object. During the rage and devastation of a long war, they cultivated the arts of peace; witness the *Journal d'Agriculture* printed at Leipzig, and the *Recueils d'Hanover* printed in that city.

Even Spain, constitutionally and habitually inactive on such occasions, in spite of all their natural indolence, and the prejudices of bigotry, invited Linnæus, with the offer of a large pension, to superintend a college founded for the purpose of making new enquiries into the history of Nature and the art of agriculture.

Among the Japanese, agriculture is in great repute: and among the Chinese it is distinguished and encouraged by the court beyond all other sciences. The Emperor of China yearly, at the beginning of spring, goes to plough in person, attended by all the princes and grandees of the empire. The ceremony is performed with great solemnity; and is accompanied with a sacrifice, which the emperor, as high-priest, offers to Chang-Ti, to ensure a plentiful crop in favour of his people.

But, without any improper partiality to our own country, we are fully justified in asserting, that Britain alone exceeds all modern nations in husbandry; and from the spirit which for the last twenty years has animated many of our nobility and gentry, to become the liberal patrons of improvement, there is reason to hope that this most useful of arts will, in a few years, be carried to a greater pitch of perfection than it has ever yet attained in any age or country.—The Royal Society, the Bath Society, and the Society of Arts, &c. in particular, have been signally useful in this respect; and the other associations, which are now established in many parts of the kingdom, co-operate with them in forwarding their laudable design.

It is not, however, to the exertion of public societies, excellent and honourable as they are, that all our modern improvements in agriculture owe their origin. To the natural genius of the people have been added the theory and practice of all nations in ancient and modern times. This accumulated mass of knowledge has been arranged, divided, and subdivided; and after passing the test of practical experiments, the essential and most valuable parts of it have been preserved, improved, and amply diffused in the works of Lord Kames, Mr Young, Stillingfleet, Dr Hunter, Anderson, Dickson, Ellis, Randal, Lisle, Marshal, Mortimer, Duhamel, Bradley, Kent, Mills, and a few other writers upon this great art of rendering mankind happy, wealthy, and powerful.

PART I. THEORY OF AGRICULTURE.

IN an art so extensively useful to mankind, and which has been so universally practised since the creation of the world, it is natural to expect the most exact and perfect theory. But in this we are totally disappointed.

Ignorance of the food of vegetables, the reason of imperfection in the theory of agriculture.

One reason of this want of a distinct theory of agriculture is, the ignorance of what is properly the food of vegetables; for as the art of agriculture consists principally in supplying them with a proper quantity of food, in the most favourable circumstances, it is evident, we might proceed upon a much surer foundation

if we could ascertain what their proper nourishment is, than we can do without this knowledge.—The reason of the great differences regarding the practice, probably, is the difficulty of making experiments in agriculture. It is not in this art as in Mechanics, Chemistry, &c. where an experiment can be made in an hour, or a day or two at farthest: an experiment in agriculture cannot be properly made in less than several years. Some favourable unobserved circumstances, quite foreign to the experiment itself, may concur to produce plentiful crops for a year or two:

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and

Theory.

and thus the farmer may be induced to publish his fancied improvements; which failing in the hands of others, or perhaps even in his own on a repetition of the experiment, the new improvements are totally neglected, and things continue in their old way. Were he, however, capable of seeing and handling the food of vegetables, as well as he can do that of a horse or an ox, and procuring it in any imaginable quantity, it is plain, that he would be able to cause vegetables grow in their utmost luxuriance, or, if we may be allowed the expression, *fatten* them, with as great certainty as he can fatten a horse or an ox, when he hath plenty of proper food to give them.—To ascertain what this food is, therefore, must be a step towards the perfection of agriculture; and to this we shall contribute our endeavour.

SECT. I. Of the proper Food of Plants.

2
Various
suppositions
concerning
the food of
plants.

WE shall not here spend time in refuting the theories of those who imagined the vegetable food to consist of oily and saline substances. A more probable supposition has been, That Water and Air are the proper vegetable food, to which alone they owe their increase in bulk and weight.—That plants cannot be supported without both these, is very certain: but we know, that air is a compound fluid; and water is never without some impurities, so may also be considered as a compound.—Is it then the aqueous, the earthy, the acid, or the phlogistic part of the air, which nourishes plants? In like manner, is it the pure elementary part of water which nourishes them? or does it contribute to their growth only by the heterogeneous substances which it contains?

3
Vegetables
thrive in
putrid air.

From Dr Priestley's experiments on different kinds of air, it appears that the purest kind of that fluid is not the fittest for the purposes of vegetation. On the contrary, vegetables flourished in a surprising degree when confined in a small quantity of air made perfectly noxious by the putrid effluvia of animal bodies.—Hence it appears probable, that such effluvia, or, in other words, the essence of corrupted matter, constitute at least one species of vegetable food; and when vegetables are put into such circumstances that the steams of putrefying bodies can have access to them, we are sure they will thrive the better.

4
Water ca-
pable of im-
bibing pu-
trid efflu-
via.

The Doctor also found, that by agitating putrid air in water, part of which was exposed to the atmosphere, the water acquired a very putrid noxious smell; which shows, that water, as well as air, is capable of absorbing those effluvia which are found proper food for vegetables. We cannot help concluding, therefore, that in the continual ascent of water in vapour, and its descent again in rain, which is a much more effectual agitation than could be made by Dr Priestley, the water must be very intimately combined with the *phlogistic* or putrid effluvia which are contained in the air. To this union we are led strongly to suspect that rain-water owes its fertilizing qualities; for the purest spring waters, though most wholesome for animals, are not found to be fittest for promoting the growth of vegetables.—As, therefore, vegetables evidently receive nourishment both by their leaves and roots, and increase remarkably in bulk by absorbing the putrid effluvia from the air; and as

5
Putred ef-
fluvia the
proper food
of plants.

they likewise increase in bulk by admitting water to their roots, and more so when the water contains much of that kind of effluvia than when it contains less: so we would conclude, that the nourishment received by the roots of plants is of the same kind with that received by their leaves; and that this food may be given them in greater plenty than they naturally receive it, by impregnating the air which surrounds them, or the water which moistens them, with a greater quantity of putrid matter than what they contain in a natural state.

SECT. II. The foregoing Theory confirmed from considerations on the nature of vegetable Mould, and the different kinds of Manure found proper for fertilizing the Soil.

THOUGH plants will grow on any kind of earth, and flourish vigorously, if plentifully supplied with water; yet some kinds of soil are found much more proper for supplying them with nourishment than others.—We cannot, indeed, allow the inferences to be quite fair which some would draw from experiments on plants set in mere sand, &c.; viz. that the earth is of no other use to vegetation than to afford a proper support to the plant, that it be not easily moved out of its place; because the experiments made on single vegetables are always performed in or very near houses, where the air is by no means so pure as in the open fields, and consequently where they have an opportunity of receiving as much nourishment from the air as may compensate the want of what they would have derived from the earth if planted in a rich soil. Lord Kames, in the Gentleman Farmer, mentions an experiment wherein a pea was planted on some cotton spread on water, in a phial. It sprung, and pushed roots through the cotton into the water. The plant grew vigorously, and, at the time of his writing, the experiment carried large pods full of ripe seed.—From this experiment, or others of a similar kind, however, a farmer would not be thought to act very judiciously, who should conclude that nothing more was requisite to produce a plentiful crop, than to keep his fields constantly soaking with water, and apply his labour only for that purpose, without regarding either tillage, manure, or the difference of soils. Experience has abundantly shown, that by certain operations performed on the earth itself, it is rendered much more capable of supplying vegetables with plenty of nourishment than if such operations were omitted; and that some kinds of soils cannot without certain additions be rendered so fit for this purpose as others; and this is what constitutes the difference between a *rich* and a *poor* soil.

That species of earth which is capable of supplying the vegetable kingdom with nourishment in the greatest plenty, is found best in well cultivated garden. It is not, however, even in these, found in perfect purity; being constantly mixed with greater or less proportions of sand, small stones, &c. It can be had by itself, and entirely separated from all other substances, only by suffering vegetable or animal bodies to putrefy. By undergoing this operation, they are at last resolved into a kind of earth, which appears perfectly the same, from whatever substance it is produced. Of this earth Dr Lewis gives us the following characters. It is in-
dissoluble

Theory.

6
All kinds of
earth not
equally pro-
per for nour-
ishing ve-
getables.

7
Of the true
vegetable-
earth.

Theory. dissoluble in acids, somewhat tenacious when moistened with water, friable when dry, and acquires no additional hardness in the fire.—The chemistry of nature, and that of art, however, are so very dissimilar, that an account of the chemical properties of this earth can be but of very little service to the practice of agriculture; however, to those above mentioned we may add, that when it is distilled with a violent fire, a volatile alkaline spirit, and fœtid oil, similar to those of hartshorn or other animal substances, are obtained.

8 This earth impregnated with putrid effluvia. As the volatile alkali is known to be produced in great plenty by distilling putrid substances either animal or vegetable, the obtaining an alkaline spirit from this kind of earth is a strong argument of its being much impregnated with the putrid effluvia, which we have already mentioned as the proper vegetable food contained in the air and water. Indeed, considering that this kind of earth is produced by putrefaction, it is next to an impossibility that it should not be impregnated with putrid steams, as much as earth can be; and if the earth which is most impregnated with these steams is found to afford the greatest quantity of nourishment to vegetables, we have from thence an additional proof that they live on the putrid matter emitted from dead animals and vegetables like themselves.

9 Earth is capable of absorbing putrid steams in prodigious quantities. That we may be the more ascertained of this, it must be considered, that the earth, which undoubtedly is the great source of nourishment to vegetables, is capable of absorbing putrid effluvia more powerfully, or at least in much greater quantity, before it is saturated, than either the air or water. The practice of burying dead bodies is an undeniable proof of this. They are laid but a small depth under ground; yet the abominable stench emitted by the carcase is retained in the earth, so that it never penetrates in such a manner as to be offensive. That earth may be saturated with this putrid matter, as well as air or water, is very certain; and, in case of such a saturation, no doubt either of these will take up the superfluous quantity, and become noxious; but unless the earth is fully saturated, both of them will deposit part of what they themselves contain in the earth, and by that means become more salutary than they were before.

10 Agreeable odour emitted by moist earth. That earth is capable of attracting putrid effluvia from the air, perhaps, may not be so readily granted; and indeed we know of no experiment whereby it can be shown that putrid air is made salutary by having any kind of earth agitated in it: but if we consider the exceeding great salubrity of the air in the country, and the healthiness of those who follow the plough or are employed in digging the ground, we must at least allow, that when the ground is turned up, it communicates no kind of noxious quality to the air; which it would certainly do, if it emitted a putrid effluvia. So far from this, the smell of moist earth is always agreeable and wholesome; and here we have the satisfaction to find our theory somewhat confirmed by the celebrated Baron van Swieten, late physician to the emperors of Hungary.

“Physicians,” says he, “usually advise their patients to rustication, not only that they may enjoy a pure and freely circulating air; but that, as their strength increases, they may, disengaged from all care, exercise their body by the slighter labours of agriculture, and other country amusements.”

Theory. “There may perhaps be another cause why rustication will be of benefit in consumptions. It is well known, that, after some days drought, on the falling of rain that moistens the earth, there arises a grateful smell, which we all are sensible of; and this is commonly attributed to the vegetables, which before sapless, but now refreshed by rain, perspire more copiously. But Reaumur observed that a like fragrant smell is also perceptible after rain when the corn has been cut down in the fields, where there only remains dry stubble; and examining the matter more particularly, he found that dry earth is without smell, but as soon as it is moistened to the degree of having the consistence of softish pap, it then diffuses a strong smell; but if more water is added, the smell is diminished, nay even quite dissipated. Neither does it seem an easy matter to exhaust that power of producing smells which the earth is possessed of. Every day during a fortnight, he made cakes of moistened earth; and having dried and wetted them over again, he could not perceive that the earth was less fragrant after all these repeated experiments, if it was again wetted. He further observed, that this fragrant smell does not diffuse itself to any thing at a great distance, without being much diminished, and soon entirely gone.—It has been observed, that this expiration of the earth ceases if thunder and storms soon follow: while they continue, it begins to return; and when over, the same fragrant smell of the earth for some hours affects the smell of a man as he walks along over a considerable tract of ground. There is no one, I believe, but has sometimes made this observation; and hence the earth, when moistened to a certain degree, seems to exhale fragrant odours, and indeed various in various places, as we are sensible of from their diversity. They are for the most part of a salubrious quality; as some persons quite faint and languid in the summer-heats perceive themselves wonderfully refreshed, whilst, after rain, they snuff up the fragrant odour. In some places those effluvia are perhaps bad, and may be the causes of diseases.”

This property of emitting a fragrant smell is likewise taken notice of by Dr Home in his Principles of Agriculture and Vegetation. Some physicians have prescribed a bath of earth for the cure of consumptive patients; and Dr Solano de Luque was of opinion, that the earth had the property of absorbing contagious miasmata into it: but whether it can absorb these miasmata from living bodies or not, it certainly can absorb them from dead ones; for a piece of putrid meat will be much sweetened by lying for a short time in the ground.

11 From all this we cannot indeed infer, that putrid Power of air is sweetened by mere earth; but we discover what transmutation in the earth asserted. is perhaps more important, namely, that though earth is the common receptacle of all putrid matters both animal and vegetable, there is a change made on them when in it, which cannot be made either by air or water. Thus, if the carcase of a small animal is left to putrefy in the air, it becomes exceedingly offensive, and continues so from first to last. The same thing happens if it is left to putrefy in water. But, in earth, the case is quite different. After the carcase is consumed, the earth which has imbibed all the putrid steams, instead of exhaling an offensive odour, diffuses an agreeable one; and thus we may see that it is endowed with a power no less remarkable than that of attraction

Theory.

traction of repulsion, and which we may distinguish by the name of *transmutation*. With regard to water, the case is more evident; for the most putrid water will be sweetened by percolation through earth, or even running in a channel for some time on its surface; but if it contains any impurities of the saline kind, they will not be separated, or at least in very small quantity.

12
Attraction
insufficient
to solve the
phenomena
of vegeta-
tion.

The existence of such a power as that of transmutation we will be obliged to own, whatever we imagine the vegetable food to consist of; for it is impossible to solve the phenomena of vegetation by attractions and repulsions. If we suppose the vegetable food to be salt, let us attract and repel salt as we will, it remains salt from first to last. Let us suppose it water, the case is the same; and, by mere attraction, nothing but masses of salt, or pools of water, could be produced. The case is the same on our own hypothesis; for, supposing plants composed of the putrid effluvia of others, and of dead animals, if nature was endued with no other power than attraction or repulsion, the vegetable would necessarily be a corrupted mass like that of which it was composed.—This power, as we have already seen, resides only in the earth, and in the vegetables themselves; air and water can indeed act as powerful solvents, but cannot transform or compound.

13
Confirma-
tion of the
above theo-
ry from the
different o-
perations of
agriculture.

We must next consider the nature of those different operations, which, from time immemorial, have been performed on the earth, in order to cause it produce the greatest crops of vegetables. If all of these shall be found conspiring to one general purpose, then the shortest and most easy method of attaining that purpose is undoubtedly the most proper to be practised in agriculture, whether it hath been as yet put in execution or not. These are,

14
Fallowing.

1. *Frequent ploughing, or Fallowing*—The immediate consequences of this is to expose different quantities of the soil to the action of the air and sun, which will not fail to exert their solvent powers upon it. In consequence of this action, the earth is partly reduced to powder; many of the roots of vegetables, with which it always abounds, are dissolved and putrefied; and the earth produced from them mixes with the rest, as well as the effluvia they emit during their dissolution. The earth soon begins again to exert its prolific powers, and a crop of vegetables is produced. By a repetition of the ploughing, these are turned with their roots upwards, are exposed to the solvent powers of the air and light; in consequence of which they die, are putrefied, and more of the native soil is reduced to powder, and mixed with them. By a frequent repetition of this process, the soil becomes vastly more tender, and approaches to the nature of garden-mould, and its fertility is considerably increased.

15
The capaci-
ty of a soil
to retain
water not
increased by
fallowing.

Lord Kames is of opinion, that the reason of the fertility of any soil being increased by fallowing, is, that its capacity of retaining water is increased. But this cannot be admitted; for so far from being more disposed to retain water by its pulverization, the soil is evidently more disposed to part with it, either by evaporation, or by suffering the moisture to percolate thro' it. In this respect it is far inferior to clay; for though dry garden-mould absorbs water much more quickly than clay, it also dries much sooner, and thus all the advantage is lost.

To those who reckon the food of vegetables to consist of oils or salts, the operation of fallowing ground must appear an useless one, as it can tend neither to produce oils nor salts, but to destroy them. As its utility, however, cannot be denied, the favourers of this theory imagine, that the ground, by repeated operations of this kind, is fitted for attracting the nitrous salts from the air: but it is found, that these salts cannot be attracted by earth, or any other substance, even when exposed for a great length of time to the air with a view to produce saltpetre; which gives a strong suspicion against their existence; and even if nitre is mixed with the soil, it is found to be detrimental, and will kill or poison plants instead of nourishing them.

2. *Overflowing the ground with water*.—This is found prodigiously to increase the fertility of any soil. It is well known how much Egypt owes to the annual overflowing of the Nile; and even in this country the overflowing of any ground is found to be attended with great advantage. This is practised by Mr Bakewell of Liecestershire, famous for his improvements in the breed of cattle; and he finds it fully to answer an annual manuring of any other sort. It is also recommended by Mr Anderson of Monkshill, in his *Essays on Agriculture*.

The fertilizing quality of water will easily be accounted for on the same principles. When grown vegetables are covered with water, their growth, however vigorous before, is immediately stopt, unless they be of the aquatic kind: they die, are dissolved, and putrefied; in which case, their finer parts are undoubtedly absorbed by the earth: and thus the *floating*, as it is called, of fields with water, answers the purpose of fallowing with very little trouble. This is not all: for stagnating water always deposits a sediment, which mixing with the dissolved parts of the vegetables all over the field, forms an excellent manure; and when the water is allowed to run off, the heat of the sun soon brings the highest degree of putrefaction on the dead vegetables: the effluvia of which mixing with the mud deposited from the water, makes it exceedingly rich.

Upon the supposition of oily and saline food for vegetables, this operation must certainly be prejudicial; for nothing can so effectually deprive any substance of salt as steeping it in water. Neither will water either deposit oil from itself, or suffer it to mix with the ground if accidentally brought to it; nay, though a field were previously impregnated with oil, upon overflowing it with water great part of the oil would be separated, and rise to the top: so that, in either case, this operation could not fail to impoverish land rather than enrich it; and as vegetables are found to be supplied with food in plenty by an operation which must undoubtedly tend to take away both oils and salts from them, we cannot help thinking this a demonstration that their food is composed neither of oil nor salt.

3. *Manuring*, or mixing the soil with different substances.—We shall here confine ourselves to those which are of undoubted efficacy, and have their credit established by long experience. These are, 1. lime, chalk, marl, shells, or other earths, called by the chemists *calcareous earths*; 2. soot; 3. ashes; 4. dung of different kinds.—(1.) The lime, chalk, marl, and shells, are all found to be of the same nature. The marl differs from the rest, only in having a mixture of clay along

Theory.

16

Oils and
salts not the
true vege-
table food.

17

Overflow-
ing the soil
with water.

18

Reasons of
the increase
of fertility
by the over-
flowing.

19

Oils & salts
cannot be
the vegeta-
ble food.

20

Of manures,
and their o-
peration.

along with its calcareous part. These contain neither salt nor oil of any kind; they readily imbibe water, and as readily part with it. Quicklime, indeed, retains water very obstinately: but such lime as is laid upon the ground soon returns to the same state in which it originally was; and powdered limestone is found to answer as well for the purposes of manure as that which has been burnt; so that here we may consider them all as substances of the same class.—If any of these substances are mixed with dead animal or vegetable bodies, they remarkably quicken their dissolution and corruption, as appears from Sir John Pringle's experiments on putrefaction. When mixed with the soil, therefore, they must undoubtedly exert their powers on such substances as they find there, in the same manner as they do on others; that is, they must hasten their dissolution and putrefaction, and give the pure vegetable mould an opportunity of absorbing their putrid steams, and consequently of being fertilized by it in the same manner as by putrid substances of any kind. (2.) Those who contend for oily and saline principles in the vegetable food, avail themselves of the usefulness of foot as a manure; which is not only oily of itself, but affords a great quantity of volatile salt, along with some neutral sal ammoniac. It must be remembered, however, that not an atom either of volatile salt or sal ammoniac can be extracted from foot without a considerable heat, which no soil can give, nor could any vegetable bear. Neither doth its oil appear without a great degree of heat: and though it feels somewhat unctuous to the touch, this is but a mere deception; for no true oil, capable of floating on water, can be obtained from foot without distillation. It is impossible, therefore, that foot can act upon the soil either as an oily or a saline substance; how far it is capable of dissolution by putrefaction, or being otherwise converted into an earth, hath not yet been determined by experiments; but as it yields, on distillation, the same principles which are obtained from animal or putrefied vegetable substances, it is probable that foot enriches the ground in the same manner that they do. (3.) The use of ashes in manure is likewise urged as an argument for the food of vegetables being of a saline nature; as it is known, that the common alkaline salts are procured by lixiviating the ashes of wood and other vegetables. Experience, however, shows us, that ashes are no less fit for manure after the salt is extracted from them than before. Indeed, if there be any difference, it is in favour of the washed ashes. The alkali itself, though in Sir John Pringle's experiments it was found to be *antiseptic*, or a resister of putrefaction, is nevertheless a powerful dissolvent; and as it must soon lose its alkaline properties when mixed with the earth, in consequence of the universal existence of the vitriolic acid, those substances which it has dissolved will be more disposed to putrefaction than before, and consequently tend to fertilize the ground in the manner we have already described. The washed ashes are *septic*, or promoters of putrefaction, and consequently act in the same manner as chalk or limestone. (4.) All kinds of dung are so much disposed to putrefaction, that it is difficult to imagine any other way in which they can be serviceable to vegetation than by their putrid effluvia.—People indeed may dream of imaginary salts in dung; but if they knew or considered the difficulty of procuring

salt of any kind from dung, they would probably alter their sentiments. The volatile salts procured from this as well as other animal matters, are mere creatures of the fire: putrid urine produces them indeed without heat, but scarce any other animal substance. Nevertheless, other putrid substances will fertilize the ground as well as urine, and therefore must act in some other way than by their salts. Though Dr Priestley's experiments had never been made, we could have formed no other rational supposition concerning the manner in which putrid substances fertilize the earth, than what we have already done; but as he has shown that vegetables are prodigiously increased in bulk by the mere contact of these putrid steams, where no saline substances could have access to them, we cannot help thinking this a decisive experiment concerning the manner in which the ground is fertilized by manuring with dung or other putrid substances.

We shall conclude this part of the subject with an account of some experiments concerning the effects of saline substances on the growth of vegetables. The following are related by Lord Kames, in his *Gentleman Farmer*.—"A number of Jerusalem artichokes were set in pots filled with pure sand. One plant was kept as a standard, being nourished with water only. Other plants of the same kind were nourished with water in which salt of tartar, a fixed alkali, was dissolved. These grew more vigorously than the standard plant; but, by reiterated waterings, there came to be such an accumulation of the fixed alkali among the sand, as to make the plants decay, and at last to die. Some plants were nourished with water in which sal ammoniac, a volatile alkali, was dissolved. These grew also well for some time; but, like the former, were destroyed by frequent reiterations of it. Weak lime-water promoted the growth of its plants more than common water. But water completely saturated with quicklime, proved more noxious than that which contained a fixed alkali, though less than that which contained a solution of volatile alkali.—Urine promoted, for a long time, the growth of its plants; and *the most putrid appeared to have the strongest effect*; but at last it totally destroyed them. *Water impregnated with putrid animal and vegetable substances, did more effectually promote the growth of its plants than any other solution; and in every stage of the process appeared to be salutary.*"

With regard to other saline substances, there are not many experiments which can be depended upon concerning their qualities as a manure. Mr Anderson relates an experiment made with common salt; the success of which, we apprehend, may justly enough be taken as a specimen of what is to be expected from manures of a similar kind. He marked out a circle of six feet diameter in the middle of a grass-field, which he distinguished by driving a stake in its centre. All over this circle he strewed common salt, which, about the stake, lay near an inch thick on the ground. In this state he left it to the operations of nature. The grass sprung up as usual, neither better nor worse about the stake than in the rest of the field, and the place where the circle was could be distinguished only by the stake, which was left there for some years.

Upon these experiments we need make very few observations. They are so much in favour of our theory, that they seem made on purpose to confirm it. The fixed

Theory.

21
Effects of
saline sub-
stances on
growing
vegetables.

22

Common
salt ineffec-
tual as a
manure.

Theory.

fixed alkali employed in Lord Kames's experiments would first exert its solvent powers on such heterogeneous substances as it met with among the sand; for no sand can be supposed to be perfectly free of these. As long as it exerted its strength on these only, the plant would thrive, for the reasons we have already mentioned; but having exhausted the small quantity of substances contained in the sand, it would next attack the plant itself, which consequently would decay and die. The same effects would necessarily follow in a greater degree from strong lime-water which contains lime in its caustic state; for this is a more powerful solvent than fixed alkali itself, and would not fail to destroy every thing it touched; nor is it at all improbable that the plant would seem to grow vigorously by the dissolution of part of its own roots, more nourishment being by this means given to those which remained sound.—Volatile alkali is likewise a powerful solvent: but, by reason of its volatility, would exert its caustic power on the plant sooner than either lime or fixed alkali; and accordingly it seems to have been the most destructive of any thing that was tried. It seems owing to this, that putrid urine at last destroyed the plants whose growth it so long promoted; while water impregnated with other putrid matters, which yield no volatile alkali without heat, proved always salutary.

23
End to be
kept in view
by a farmer.

From all this, we may draw the following general conclusion, *viz.* That the principal end which a farmer ought to keep in view, is to impregnate his ground as much as possible, with substances which either actually contain putrid matter, or which are in their own nature *septic*, or promoters of putrefaction. To impregnate the air with putrid effluvia is impossible: and tho' it could be done, would be highly dangerous; for however salutary such effluvia may be to vegetables, nothing can be more fatal to mankind. The putrid substances, therefore, can only be used by mixing them with the earth; and in whatever manner they can be most perfectly, and in the greatest quantity, mixed with the soil, there the best crops may be expected.

SECT. III. *Of the different Soils, and the Manures most proper for each.*

24
Richest soils
must at last
be improved.

ACCORDING to the theory we have just now laid down, the richest soil must be that which contains the greatest quantity of putrid matter, either animal or vegetable; and such is the earth into which animal and vegetable substances resolve themselves. Was this earth to be had in perfection, it is evident it could not stand in need of manure of any kind, or be in the least enriched by it; for containing an immense quantity of putrid matter, it would freely communicate it to the vegetables planted in it, which would grow in the most luxuriant manner, without requiring any other care than that of keeping them constantly supplied with water. If we suppose the crop left upon the ground to putrefy and mix with the earth as before, the soil will contain the same quantity of putrid matter the second year that it did the first, and be equally prolific: but if the crop is removed to another place, and nothing is brought back to enrich the ground in its stead, it is evident, that it will contain less of the true vegetable food the second year than it did the first, and consequently be less prolific. For some time, however, the difference

will not be perceptible; and people who are in possession of such ground may imagine that they enjoy a soil which will be perpetually fertile; but long experience has taught us, that the richest soils will at last be exhausted by repeated cropping without manure, as according to our theory they ought to be.

Where the ground has been suffered to remain uncultivated for many ages, producing all that time succulent plants which are easily putrefied, and trees, the leaves of which likewise contribute to enrich the ground by their falling off and mixing with it, the soil will in a manner be totally made up of pure vegetable earth, and be the richest, when cultivated, that can be imagined. This was the case with the lands of America. They had remained uncultivated perhaps since the creation, and were endowed with an extraordinary degree of fertility; nevertheless we are assured by one who went to America in order to purchase lands there, that such grounds as had been long cultivated, were so much exhausted, as to be much worse than the generality of cultivated grounds in this country. Here, then, we have an example of one species of poor soil; namely, one that has been formerly very rich, but has been deprived, by repeated cropping, of the greatest part of the vegetable food it contained. The farmer who is in possession of such ground, would no doubt willingly restore it to its former state; the present question is, What must be done in order to obtain this end? We have mentioned several kinds of manures which long practice has recommended as serviceable for improving ground: we shall suppose the farmer tries lime, or chalk; for, as we have already seen, their operations upon the soil must be precisely the same. This substance, being of a septic nature, will act upon such parts of the soil as are not putrefied, or but imperfectly so; in consequence of which, the farmer will reap a better crop than formerly. The septic nature of the lime is not altered by any length of time. In ploughing the ground, the lime is more and more perfectly mixed with it, and gradually exerts its power on every putrescible matter it touches. As long as any matter of this kind remains, the farmer will reap good crops: but when the putrescible matter is all exhausted, the ground then becomes perfectly barren; and the caustic qualities of the lime are most unjustly blamed for *burning* the ground, and reducing it to a *caput mortuum*; while it is plain the lime has only done its office, and made the soil yield all that it was capable of yielding.

When ground has been long uncultivated, producing all the time plants, not succulent, but such as are very difficultly dissolved, and in a manner incapable of putrefaction; there the soil will be excessively barren, and yield very scanty crops, tho' cultivated with the greatest care. Of this kind are those lands covered with heath, which are found to be the most barren of any, and the most difficultly brought to yield good crops. In this case lime will be as serviceable as it was detrimental in the other: for by its septic qualities, it will continually reduce more and more of the soil to a putrid state; and thus there will be a constant succession of better and better crops, by the continued use of lime when the quantity first laid on has exerted all its force. By a continued use of this manure, the ground will be gradually brought nearer and nearer to the nature of garden mould; and, no doubt, by proper care, might be made

Theory.

25
One species
of poor soil
destroyed
by lime.

26
A species of
poor soil
meliorated
by lime.

Theory. made as good as any: but it will be as great a mistake to imagine, that, by the use of lime, this kind of soil may be rendered perpetually fertile, as to think that the other was naturally so; for though lime enriches this soil, it does so, not by adding vegetable food to it, but by preparing what it already contains; and when all is properly prepared, it must as certainly be exhausted as in the other case.

27
Poor soils,
how resto-
red.

Here, then, we have examples of two kinds of *poor* soils; one of which is totally destroyed, the other greatly improved, by lime, and which therefore require very different manures; lime being more proper for the last than dung; while dung, being more proper to restore an exhausted soil than lime, ought only to be used for the first. Besides dunging land which has been exhausted by long cropping, it is of great service to let it lie fallow for some time: for to this it owed its original fertility; and what gave the fertility originally, cannot fail to restore it in some degree.

By attending to the distinction between the reasons for the poverty of the two soils just now mentioned, we will always be able to judge with certainty in what cases lime is to be used, and when dung is proper. The mere poverty of a soil is not a criterion whereby we can judge; we must consider what hath made it poor. If it is naturally so, we may almost infallibly conclude, that it will become better by being manured with lime. If it is *artificially* poor, or exhausted by continual cropping, we may conclude that lime will entirely destroy it.—We apprehend, that it is this *natural* kind of poverty only which Mr Anderson says, in his *Essays on Agriculture*, may be remedied by lime; for we can scarce think that experience would direct any person to put lime upon land already exhausted. His words are,

28
Mr Ander-
son's opini-
on concern-
ing lime.

“Calcareous matters act as powerfully upon land that is naturally poor, as upon land that is more richly impregnated with those substances that tend to produce a luxuriant vegetation.”

“Writers on agriculture have long been in the custom of dividing manures into two classes, *viz.* *Enriching* manures, or those that tended directly to render the soil more prolific, however sterile it may be; among the foremost of which was dung: *Exciting* manures, or those that were supposed to have a tendency to render the soil more prolific, merely by acting upon those enriching manures that had been formerly in the soil, and giving them a new stimulus, so as to enable them to operate anew upon that soil which they had formerly fertilized. In which class of stimulating manures, *lime* was always allowed to hold the foremost place.

“In consequence of this theory, it would follow, that lime could only be of use as a manure when applied to rich soils—and when applied to poor soils, would produce hardly any, or even perhaps hurtful effects.

“I will frankly acknowledge, that I myself was so far imposed upon by the beauty of this theory, as to be hurried along with the general current of mankind, in the firm persuasion of the truth of this observation, and for many years did not sufficiently advert to those facts that were daily occurring to contradict this theory.—I am now, however, firmly convinced, from repeated observations, that lime, and other calcareous manures, produce a much greater *proportional* improvement upon poor soils than such as are richer.—And

Theory. that lime alone, upon a poor soil, will, in many cases, produce a much greater and more lasting degree of fertility than dung alone.”

Thus far Mr Anderson's experience is exactly conformable to the theory we have laid down, and what ought to happen according to our principles. He mentions, however, some facts which seem very strongly to militate against it; and indeed he himself seems to proceed upon a theory altogether different.

29
“Calcareous matter alone (says he) is not capable of rearing plants to perfection;—mould is necessary to be mixed with it in certain proportions, before it can form a proper soil. It remains, however, to be determined, what is the due proportion of these ingredients for forming a proper soil. Query concern-
cerning the
nature of a
proper soil.

“We know that neither chalk, nor marl, nor lime, can be made to nourish plants alone; and soils are sometimes found that abound with the two first of these to a faulty degree. But the proportion of calcareous matter in these is so much larger than could ever be produced by art, where the soil was naturally destitute of these substances, that there seems to be no danger of erring on that side. Probably it would be much easier to correct the defects of those soils in which calcareous matters superabound, by driving earth upon them as a manure, than is generally imagined; as a very small proportion of it sometimes affords a very perfect soil. I shall illustrate my meaning by a few examples.

30
“Near Sandside, in the county of Caithness, there is a pretty extensive plain on the sea-coast, endowed with a most singular degree of fertility. In all seasons it produces a most luxuriant herbage, although it never got any manure since the creation; and has been for time immemorial subjected to the following course of crops. Examples
of soil per-
petually
fertile.

“1. Bear, after once ploughing from grass, usually a good crop.

“2. Bear, after once ploughing, a better crop than the first.

“3. Bear, after once ploughing, a crop equal to the first.

“4. 5. and 6. Natural grass, as close and rich as could be imagined, might be cut, if the possessor so inclined, and would yield an extraordinary crop of hay each year.

“After this the same course of cropping is renewed. The soil that admits of this singular mode of farming, appears to be a pure incoherent sand, destitute of the smallest particle of vegetable mould; but, upon examination, it is found to consist almost entirely of broken shells: the fine mould here bears such a small proportion to the calcareous matter, as to be scarce perceptible, and yet it forms the most fertile soil that ever I yet met with.

“I have seen many other links (downs) upon the sea-shore, which produced the most luxuriant herbage, and the closest and sweetest pile of grass, where they consisted of shelly sand; which, without doubt, derive their extraordinary fertility from that cause.

“A very remarkable plain is found in the island of Jir-eye, one of the Hebrides. It has been long employed as a common; so that it has never been disturbed by the plough, and affords annually the most luxuriant crop of herbage, consisting of white clover, and other

Theory. other valuable pasture-grasses, that can be met with any where. The soil consists of a very pure shelly sand.

“From these examples, I think it is evident, that a very small proportion of vegetable mould is sufficient to render calcareous matter a very rich soil. Perhaps, however, a larger proportion may be necessary when it is mixed with clay than with sand; as poor chalky soils seem to be of the nature of that composition.

To these examples brought by Mr Anderson, we may add some of the same kind mentioned by Lord Kames. His lordship having endeavoured to establish the theory of water being the only food of plants, tho’ he himself frequently deviates from that theory, yet thinks it possible, upon such a principle, to make a soil perpetually fertile.

“To recruit (says he), with vegetable food, a soil impoverished by cropping, has hitherto been held the only object of agriculture. But here opens a grander object, worthy to employ our keenest industry, that of making a soil perpetually fertile. Such soils actually exist; and why should it be thought, that imitation here is above the reach of art? Many are the instances of nature being imitated with success. Let us not despair while any hope remains; for invention never was exercised upon a subject of greater utility. The attempt may suggest proper experiments: it may open new views: and if we fail in equalling nature, may we not, however, hope to approach it? A soil perpetually fertile must be endowed with a power to retain moisture sufficient for its plants, and at the same time must be of a nature that does not harden by moisture. Calcareous earth promises to answer both ends: it prevents a soil from being hardened by water; and it may probably also invigorate its retentive quality. A field that got a sufficient dose of clay marl, carried above 30 successive rich crops, without either dung or fallow. Doth not a soil so meliorated draw near to one perpetually fertile? Near the east side of Fife, the coast for a mile inward is covered with sea-sand, a foot deep or so; which is extremely fertile, by a mixture of sea-shells reduced to powder by attrition. The powdered shells, being the same with shell-marl, make the sand retentive of moisture; and yet no quantity of moisture will unite the sand into a solid body. A soil so mixed, seems to be not far distant from one perpetually fertile. These, it is true, are but faint essays; but what will not perseverance accomplish in a good cause?”

31
Inconsistency in Lord Kames's theory.

Having thus, in a manner, positively determined with Mr Anderson, that no dose of calcareous matter can possibly be too great, we cannot help owning ourselves surprised on finding his Lordship expressing himself as follows: “An overdose of shell-marl, laid perhaps an inch, and an inch and a half, or two inches thick, produces, for a time, large crops; but at last it renders the soil a *caput mortuum*, capable of neither corn nor grass; of which there are too many instances in Scotland; the same probably would follow from an overdose of clay-marl, stone-marl, or pounded limestone.” —To account for this, he is obliged to make a supposition directly contrary to his former one; namely, that calcareous matter renders the soil *incapable* of retaining water. This phenomenon, however, we think is solved upon the principles above laid down, in a satisfactory manner, and without the least inconsistency.

As to rendering soils perpetually fertile, we cannot

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help thinking the attempt altogether chimerical and vain. There is not one example in nature of a soil perpetually fertile, where it has no supply but from the air and the rain which falls upon it. The above recited examples can by no means be admitted as proofs of perpetual fertility. We know, that the grass on the banks of a river is much more luxuriant than what grows at a distance: the reason is, that the water is attracted by the earth, and communicates its fertilizing qualities to it; but was the river to be dried up, the grass would soon become like the rest. Why should not the ocean have the same power of fertilizing plains near its shores, that rivers have of fertilizing small spots near their banks? We see, however, that it hath not; for the sea-shores are generally sandy and barren. The reason of this is, that the waters of the ocean contain a quantity of loose acid*; and this acid is poisonous to plants; but abstracting this acid part, we hesitate not to affirm, that sea-water is more fertilizing than river-water. It is impossible to know how far the waters of the ocean penetrate under ground through a sandy soil. Where they meet with nothing to absorb their acid, there the ground is quite barren; but in passing through an immense quantity of broken shells, the calcareous matter, we are very certain, will absorb all the acid; and thus the soil will be continually benefited by its vicinity to the ocean. All the above fields, therefore, are evidently supplied with nourishment from the ocean: for if the salt-water has sufficient efficacy to render fields which are in its neighbourhood barren, why should it not render them fertile when the cause of barrenness is removed from its waters?

Theory. Perpetual fertility of soils chimerical.

*See Water.

After all, the field in Caithness, mentioned by Mr Anderson, seems to have been perpetually fertile only in grass; for though the second year it carried a better crop of bear than it did the first, yet the third year the crop was worse than the second, and only equal to the first. Had it been ploughed a fourth time, the crop would probably have been worse than the first. Ground is not near so much exhausted by grass as corn, even though the crop be cut and carried off; and still less, if it only feeds cattle, and is manured by their dung; which appears to have been the case with this field. Lord Kames, indeed, mentions fields in Scotland, that, past memory, have carried successive crops of wheat, pease, barley, oats, without a fallow, and without a manure; and particularises one on the river Carron, of nine or ten acres, which had carried 103 crops of oats without intermission and without manure: but as we are not acquainted with any such fields, nor know any thing about their particular situation, we can form no judgment concerning them.

Besides the two kinds of soils above mentioned, there are others, the principal ingredient of which is clay or sand. The first of these is apt to be hardened by the heat of the sun, so that the vegetables can scarce penetrate it in such a manner as to receive proper nourishment. The second, if it is not situated so as to receive a great deal of moisture, is very apt to be parched up in summer, and the crop destroyed; nor has it sufficient adhesion to support plants that have few roots and grow high. From these opposite qualities, it is evident that these two soils would be a proper manure for one another; the clay would give a sufficient degree of firmness to the sand, and the sand would break the

33
Clay and sandy soils.

Theory. the too great tenacity of the clay. According to Dr Home's experiments, however, sand is the worst manure for clay that can be used. He recommends marle most. To reduce clay-ground as near as possible to the form of pure vegetable mould, it must first be pulverized. This is most effectually performed by ploughing and harrowing; but care must be taken not to plough it whilst too wet, otherwise it will concrete into hard clots which can scarcely be broken. After it is pulverized, however, some means must be taken to keep it from concreting again into the same hard masses as before. According to Lord Kames, though clay, after pulverization, will concrete into as hard a mass as before, if mixed with water; yet if mixed with dunghill juice, it will not concrete any more. Lime also breaks its tenacity, and is very useful as a manure for this kind of soil.

³⁴ **Fertility of the earth limited.** The conclusion we wish the practical farmer to draw from our theory is, That there is a certain limit to the fertility of the earth, both as to duration and to degree, at any particular time: that the nearer any soil approaches to the nature of pure garden-mould, the nearer it is to the most perfect degree of fertility; but that there are no hopes of keeping it perpetually in such a state, or in any degree of approximation to it, but by constant and regular manuring with dung. Lime, chalk, marle, &c. may be proper to bring it near to this state, but are absolutely unfit to keep it continually so. They may indeed for several years produce large crops; but the more they increase the fertility for some years, the sooner will they bring on an absolute barrenness; while regular manuring with plenty of dung will always ensure the keeping up the soil in good condition, without any occasion for fallow. What we have said concerning the use of lime, &c. applies likewise to the practice of frequent ploughing, though in a less degree. This tends to meliorate ground that is naturally poor, by giving an opportunity to the vegetable parts to putrefy; but when that is done, it tends to exhaust, though not so much as lime. A judicious farmer will constantly strive to keep his lands always in good condition, rather than to make them suddenly much better; lest a few years should convince him that he was in reality doing almost irreparable mischief, while he fancied himself making improvements. As for the ridiculous notions of stimulating the ground by saline manures, we hope they will never enter the brain of any rational practitioner of agriculture.

SECT. IV. *Of the different kinds of Vegetables proper to be raised with a view to the Melioration of Soil.*

³⁵ **Soil pulverized by certain vegetables.** THE methods of meliorating soils, which we have mentioned above, consisting of tedious and laborious operations that yield no return at first, it is natural for a farmer to wish for some method of meliorating his ground, and reaping crops at the same time. One very considerable step towards the melioration of ground is, its pulverization. This is accomplished by repeated ploughings (A), as already mentioned; especially if performed in autumn, that the ground may be exposed to

VOL. I. Part I.

the winter's frost; but these ploughings yield no crop as long as the field is not sown. By planting in the field, however, those vegetables whose roots swell to a considerable bulk, the ground must constantly be acted upon by the swelling of their roots in all directions; and thus the growing of the crop itself may be equal, or superior, in efficacy to several ploughings, at the same time that the farmer enjoys the benefit of it. The plant most remarkable for the swelling of its roots is the potato; and by none is the ground meliorated more, or even so much. They are not, however, equally proper for all soils. In clay they do not thrive, nor are palatable; but in hard gravelly or sandy soils, they grow to a large size, and are of an excellent quality. Turnips likewise contribute to meliorate the ground, by the swelling of their roots, though not so much as potatoes. They have this advantage, however, that they will thrive in almost any soil. In clay ground, pease and beans thrive exceedingly well, and therefore are proper in this kind of soil as a preparatory for other kinds of grain. These push their roots deep into the ground, and cover it with their leaves more than other crops; so that the sun has not so much access as when it is covered with other kinds of grain. Wherever any of these kinds of vegetables are raised, it is observable, that more or less blackness is communicated to the soil: an evident sign of its melioration; this being the colour of the true vegetable mould, or *loamy soil*, as it is called.

Besides the above-mentioned plants, carrots, parsnips, cabbages, and all those vegetables which sink their roots deep in the ground, answer the same purpose of loosening and pulverising the earth; but as they will not thrive but on ground already well cultivated, they cannot be raised to any advantage for the purpose of meliorating a poor soil.

It hath been customary in many places, particularly in England, to sow turnip, pease, buck-wheat, &c. and then to plough them down for manuring the land. This being similar to that operation of nature by which she renders the uncultivated soils so exceedingly fertile, cannot fail of being attended with singular advantages; and might be looked upon as preferable even to driving dung on the land to fatten it, was it not attended with the entire loss of a crop for that year.

SECT. V. *Of destroying Weeds.*

WHAT we have already said regarding the cultivation of the soil, respects only the fitting it for producing all kinds of vegetables indiscriminately. Experience, however, shows, that the ground is naturally much more disposed to produce and nourish some kinds of vegetables than others; and those which the earth seems most to delight in, are commonly such as are of very little use to man; but if neglected, will increase to such a degree, as entirely to destroy the plants intended to be raised, or at least hinder them from coming to perfection, by depriving them of nourishment. The clearing the ground of weeds, therefore, is an article no less necessary in agriculture, than the disposing it to produce vegetables of any kind in plenty.

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(A) This, however, must be understood with some limitation: for it appears from experience, that many *light and thin* soils receive detriment rather than advantage from frequent ploughings; particularly in summer, when the sun exhales the nutritive particles in great abundance.

Theory.

36
Weeds divided into annual and perennial.

The weeds may be divided, according to the time of their duration, into *annual*, or such as spring from a seed, and die the same year; and *perennial*, that is, such as are propagated by the roots, and last for a number of years. The first kind are the least noxious, and most easily destroyed. For this purpose it will be sufficient to let them spring up till near the time of ripening their seed, and then plough them down before it comes to maturity. It is also of service to destroy such weeds as grow in borders, or neglected corners, and frequently scatter their seeds to a great distance; such as the thistle, dandelion, rag-weed, &c. for these are sufficient to propagate their species through a deal of ground; as their seeds are carried about with the wind to very considerable distances. A farmer ought also to take care, that the small seeds of weeds, separated from corn in winnowing, be not sown again upon the ground; for this certainly happens when they are thrown upon a dunghill; because, being the natural offspring of the earth, they are not easily destroyed. The best method of preventing any mischief from this cause, would be to burn them.

37
Perennial weeds, how destroyed.

Perennial weeds cannot be effectually destroyed, but by removing the roots from the ground, which is often a matter of some difficulty. Many of these roots strike so deep in the ground, that they can scarcely be got out. The only method that can be depended upon in this case, is frequent ploughing, to render the ground as tender as possible; and harrowing with a particular kind of harrow, which shall hereafter be described, in order to collect these pernicious roots. When collected, they ought to be dried and burnt, as the only effectual method of insuring their doing no further mischief.

There is a particular species of weed, peculiar only to grass-lands, of a soft spongy nature, called *fog*, which it is found very difficult to exterminate. Where the land can be conveniently tilled, this weed may be destroyed by covering it with a crop of pease, potatoes, &c. or, passing a heavy roller over the ground will be of great service; for fog owes its origin to too great a laxity of the soil, and will not grow upon firm ground.

38
Broom, furze, &c. how destroyed.

Besides these kinds of weeds which are of an herbaceous nature, there are others which are woody, and grow to a very considerable size; such as broom, furze or whins, and thorns. *Broom* is an evergreen shrub, that thrives best in sandy soil; and there it grows so vigorously, as scarce to admit any grass under it. It propagates by seed which grows in pods; and these, when fully ripe, break with violence, scattering the seeds all around. Thus, a field which is overgrown with broom, besides the old plants, always contains an infinite number of young ones; so that though the old plants die when cut over, a fresh crop constantly springs up. It may, however, be destroyed by frequent ploughing and harrowing, in the same manner as other perennial weeds are; for it does not for some time carry any seed, and the frequent ploughing encourages the vegetation of all those that are already in the ground, which cannot fail of being destroyed by frequent repetitions of the operation. Another method of destroying broom, is by pasturing the field where it grows with sheep. A few of the old bushes may be left as a shelter, and these will be in a good measure prevented from spreading by the cropping of the sheep. These animals are very fond

of broom, and greedily devour every young shoot; so that if any remain after the first year, there will not be a vestige the second. If this method of extirpating broom is equally effectual with that of frequent ploughing, it is certainly much more profitable, as there is no food more nourishing to sheep than young broom. Broom, however, is said to have a singular effect upon sheep: it makes them drunk so effectually, that when heated with a little driving, they tumble over, and lie without motion.

The *whin* is a fine evergreen shrub, carrying a sweet-smelling flower all the year round. It propagates both by seed and by its roots, which spread sometimes to the distance of 10 or 12 feet; and hence, when once established, it is with difficulty extirpated. The best method is to set fire to the whins in frosty weather; for frost has the effect to wither whins, and make them burn readily. The stumps must then be cut over with a hatchet; and when the ground is well softened by rain, it may be ploughed up, and the roots taken out by a harrow adapted to that purpose. If the field is soon laid down to grass, the whins will again spring up in great abundance, from the seeds, and small parts of the roots left in the ground. In this case, pasturing with sheep is an effectual remedy; as they are no less fond of young whins than of young broom; and if there are a sufficient number, they will not leave a single plant above ground. But if grass is not immediately wanted, the most effectual method of clearing a field of whins, is by reiterated ploughings.

The *thorn*, or *bramble*, spreads its roots very wide, and at the same time sinks them deep in the earth. Though cut in the winter, it rises, and comes to such perfection as to carry fruit in summer. It can only be extirpated by ploughing up the ground, and collecting the roots.

SECT. VI. Of the most proper kinds of Vegetables to be raised for the purposes of feeding Cattle.

THOUGH this must be an article of the utmost consequence to every farmer, we do not find that it has been much considered. Mr Anderson seems to have been the first writer on agriculture who hath properly attended to this subject; and what he hath wrote upon it, is rather a catalogue of desiderata, than any thing else: and indeed the desiderata on this subject are so many and so great, that we must acknowledge ourselves very unable to fill them up.—To attain to a competent knowledge in this respect, the following things must be taken into consideration. (1.) The wholesomeness of the food for cattle, with regard to health and strength, or fatness. (2.) The quantity that any extent of ground is capable of yielding. (3.) The quantity necessary to feed the different kinds of cattle. (4.) The labour of cultivation; and, (5) The soil they require to bring them to perfection, and the effect they have upon it.

With regard to the wholesomeness, it is plain, that as the natural food of wild cattle is the green succulent plants they meet with all the year round, food of this kind, could it be had, must be preferable to hay; and accordingly we find that cattle will always prefer succulent vegetables where they can get them. To find plants

39
Qualities of the food requisite for cattle.

Theory.

40
Cabbages,
their pro-
perties.

plants of this kind, and having proper qualities in other respects, we must search among those which continue green all the year round, or come to their greatest perfection in the winter-time.—Of these, cabbages bid fair for holding the first place; both as being very succulent, and a very large quantity of them growing upon a small space of ground. In Mr Young's Six Months Tour, we have an account of the produce of cabbages in many different places, and on a variety of soils. The produce by Mr Crow at Keplin, on a clay soil, was, on an average of six years, 35 tons per acre; by Mr Smelt at the Leases, on a sandy gravel, 18 tons per acre; by Mr Scroop at Danby, on an average of six years, 37 tons per acre: and the general average of all the accounts given by Mr Young, is 36 tons per acre.

Cabbages, however, have the great inconveniency of sometimes imparting a disagreeable flavour to the milk of cows fed with them, and even to the flesh of other cattle. This, it is said, may be prevented by carefully picking off the decayed and withered leaves: and very probably this is the case; for no vegetable inclines more to putrefaction than this; and therefore particular care ought to be taken to pull off all the leaves that have any symptoms of decay. Dr Priestley found that air was rendered noxious by a cabbage-leaf remaining in it for one night, though the leaf did not show any symptom of putrefaction.—For milk-cows, probably the cabbages might be rendered more proper food by boiling them.

41
Air rendered
noxious
by them.

42
Turnip-
rooted cab-
bage.

The culture of the turnip-rooted cabbage has lately been much practised, and greatly recommended, particularly for the purpose of a late spring feed; and seems indeed to be a most important article in the farming œconomy, as will be shown in its proper place.

43
Turnips.

Turnips likewise produce very bulky crops, though far inferior to those of cabbages. According to Mr Young's calculation, the finest soil does not produce above five tons of turnips per acre; which is indeed a very great disproportion: but possibly such a quantity of turnips may not be consumed by cattle as of cabbages; an ox, of 80 stone weight, eat 210 lb. of cabbages in 24 hours, besides seven pound of hay.

44
Carrots.

Carrots are found to be an excellent food for cattle of all kinds, and are greatly relished by them. In a rich sand, according to Mr Young's account, the produce of this root was 200 bushels per acre. In a finer soil, it was 640 bushels per acre. A lean hog was fattened by carrots in ten days time: he eat 196 lb.; and his fat was very fine, white, firm, and did not boil away in the dressing. They were preferred to turnips by the cattle; which having tasted the carrots, soon became so fond of them, as difficultly to be made to eat the turnips at all. It is probable, indeed, that carrots will make a more wholesome food for cattle than either cabbages or turnips, as they are strongly antiseptic; inasmuch as to be used in poultices for correcting the fancies of cancers. It is probably owing to this, that the milk of cows fed on carrots is never found to have any bad taste. Six horses kept on them thro' the winter without oats, performed their work as usual, and looked equally well. This may be looked upon as a proof of their salubrity as a food; and it certainly can be no detriment to a farmer to be so much versant in medical matters, as to know the impropriety of

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giving putrescent food to his cattle. It is well known, what a prodigious difference there is in the health of the human species when fed on putrid meats, in comparison of what they enjoy when supplied with food of a contrary nature; and why may there not be a difference in the health of beasts, as well as of men, when in similar circumstances?—It is also very probable, that as carrots are more solid than cabbages or turnips, they will go much farther in feeding cattle than either of them. The above-mentioned example of the hog seems some kind of confirmation of this; he being fed, for ten days together, with 21 lb. less weight of carrots than what an ox devoured of cabbages and hay in one day. There is a great disproportion, it must be owned, between the bulk of an ox and that of a hog; but we can scarce think that an ox will eat as much at a time as ten hogs. At Parlington in Yorkshire, 20 work horses, four bullocks, and six milk-cows, were fed on the carrots that grew on three acres, from the end of September till the beginning of May; and the animals never tasted any other food but a little hay. The milk was excellent, and 30 hogs were fattened upon what was left by the cattle.

Potatoes likewise appear to be a very palatable food for all kinds of cattle; and not only oxen, hogs, &c. are easily fed by them, but even poultry. The cheapness of potatoes compared with other kinds of food for cattle, cannot well be known, as, besides the advantage of the crop, they improve the ground more than any other known vegetable. According to a correspondent of the Bath Society*, "roasting pork is never so moist and delicate as when fed with potatoes, and killed from the barn-doors without any confinement. For bacon and hams, two bushels of pea-meal should be well incorporated with four bushels of boiled potatoes, which quantity will fat a hog of twelve stone (fourteen pounds to the stone). Cows are particularly fond of them: half a bushel at night, and the same proportion in the morning, with a small quantity of hay, is sufficient to keep three cows in full milk; they will yield as much and as sweet butter as the best grass. In fattening cattle, I allow them all they will eat: a beast of about 35 stone will require a bushel per day, but will fatten one-third sooner than on turnips. The potatoes should be clean washed, and not given until they are dry. They do not require boiling for any purpose but fattening hogs for bacon, or poultry; the latter eat them greedily. I prefer the champion potato to any sort I ever cultivated. They do not answer so well for horses and colts as I expected (at least they have not with me), though some other gentlemen have approved of them as substitutes for oats."

The above-mentioned vegetables have all of them the property of meliorating, rather than exhausting the soil; and this is certainly a very valuable qualification: but carrots and cabbages will not thrive except in soils that are already well cultivated; while potatoes and turnips may be used as the first crops of a soil with great advantage. In this respect, they are greatly superior to the others; as it may be disagreeable to take up the best grounds of a farm with plants designed only for food to cattle.

Buck-wheat (*Polygonum fagopyrum*) has been lately recommended as an useful article in the present as well as other respects. It has been chiefly applied to the

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feeding

Theory.

45
Potatoes.

* Letters and
Papers on
Agriculture,
&c. vol. iii.
art. 16.

46

Theory. feeding of hogs, and esteemed equal in value to barley; it is much more easily ground than barley, as a malt-mill will ground it completely. Horses are very fond of the grain; poultry of all sorts are speedily fattened by it; and the blossom of the plant affords food for bees at a very opportune season of the year, when the meadows and trees are mostly stripped of their flowers. Probably the grain may hereafter be even found a material article in distillation, should a sufficient quantity be raised with that view. From the success of some experiments detailed in the Bath Society Papers, and for which a premium was bestowed, it has been inferred, that this article ought in numerous cases to supersede the practice of summer-fallowing.

47
Whins an
excellent
food for
horses.

Whins have lately been recommended as a very proper food for cattle, especially horses; and are recommended by Mr Anderson in a particular manner. They have this advantage, that they require no culture, and grow on the very worst soil; but they are troublesome to cut, and require to be bruised in a mill constructed for this purpose; neither is the ground at all meliorated by letting whins grow upon it for any length of time. Notwithstanding these disadvantages, however, as whins continue green all the year round, and when bruised will afford an excellent succulent food, which seems possessed of strongly invigorating qualities, they may be looked upon as the cheapest winter-food that can possibly be given to cattle.—According to the calculations of Mr Eddison of Gateford, a single acre, well cropped with whins, will winter six horses: at three or four years growth, the whole crop should be taken, cut close to the ground, and carried to the mill; in which the whins are to be bruised, and then given to the horses. Four acres ought to be planted, that one may be used each year, at the proper age to be cut; and he reckons the labour of one man sufficient for providing food to this number of horses. He says they all prefer the whins to hay, or even to corn.

48
Burnet.

The herb called *burnet* hath likewise been recommended as proper food for cattle, on account of its being an evergreen; and further recommended, by growing almost as fast in winter as in summer. Of this herb, however, we have very various accounts. In a letter addressed by Sir James Caldwell, F. R. S. to the Dublin Society, the culture of this plant is strongly recommended on the authority of one Bartholomew Rocque, farmer at Walham-Green, a village about three miles south-west of London.

49
Recom-
mended by
Sir James
Caldwell.

What gave occasion to the recommendation of this plant, was, that about the year 1760, Mr Wych, chairman of the committee of Agriculture of the London Society for the encouragement of arts, manufactures, and commerce, came to Rocque (who was become very eminent by the premiums he had received from the society), and told him, he had been thinking, that as there are many animals which subsist wholly upon the fruits of the earth, there must certainly be some plant or herb fit for them that naturally vegetates in winter; otherwise we must believe the Creator, infinitely wise and good, to have made creatures without providing for their subsistence; and that if there had been no such plants or herbs, many species of animals would have perished before we took them out of the hands of nature, and provided for them dry meat at a season, when, indigenous plants having been indiscriminately

Theory. excluded, under the name of weeds, from cultivated fields and places set apart for natural grass, green or fresh meat was no longer to be found.

Rocque allowed the force of this reasoning; but said, the knowledge of a grass, or artificial pasture, that would vegetate in winter, and produce green fodder for cattle, was lost; at least, that he knew of no such plant.—Mr Wych, however, knowing how very great the advantage would be of discovering a green fodder for winter and early in the spring, wrote to Bern, and also to some considerable places in Sweden, stating the same argument, and asking the same question. His answers to these letters were the same that had been given by Rocque. They owned there must be such plant, but declared they did not know it.

Mr Wych then applied again to Rocque; and desired him to search for the plant so much desired, and so certainly existing. Rocque set about this search with great assiduity; and finding that a pimpernel, called *burnet*, was of very speedy growth, and grew near as fast in winter as in summer, he took a handful of it and carried it into his stable, where there were five horses; every one of which eat of it with the greatest eagerness, snatching it even without first smelling it. Upon the success of this experiment he went to London, and bought all the burnet-seed he could get, amounting to no more than eight pounds, it having been only used in salads; and he paid for it at the rate of 4s. a pound. Six of the eight pounds of seed he sowed upon half an acre of ground, in March, in the year 1761, with a quarter of a peck of spring-wheat, both by hand. The seed being very bad, it came up but thin. However, he sowed the other two pounds in the beginning of June, upon about six rood of ground: this he mowed in the beginning of August; and at Michaelmas he planted off the plants on about 20 rood of ground, giving each plant a foot every way, and taking care not to bury the heart. These plants bore two crops of seed the year following; the first about the middle of June, the second about the middle of September; but the June crop was the best. The year after, it grew very rank and produced two crops of seed, both very good. As it ought not to be cut after September, he let it stand till the next year; when it sheltered itself, and grew very well during all the winter, except when there was a hard frost; and even during the frost it continued green, though it was not perceived to grow. In the March following it covered the ground very well, and was fit to receive cattle.

If the winter is not remarkably severe, the burnet, though cut in September, will be 18 inches long in March; and it may be fed from the beginning of February till May: if the cattle are taken off in May, there will be a good crop of seed in the beginning of July. Five weeks after the cattle are taken off, it may be removed, if that is preferred to its standing for seed; it grows at the rate of an inch a-day, and is made into hay like other grass. It may be mown three times in one summer, and should be cut just before it begins to flower. Six rood of ground has produced 1150 pounds at the first cutting of the third year after it was sowed; and, in autumn 1763, Rocque sold no less than 300 bushels of the seed.

According to Rocque, the soil in which burnet flourishes best, is a dry gravel; the longest drought never hurts

Theory. hurts it: and Sir James Caldwell asserts, that he saw a very vigorous and exuberant plant of this kind, growing from between two bricks in a wall in Rocque's ground, without any communication with the soil; for he had cut away all the fibres of the root that had stretched downward, and penetrated the earth, long before.

Burnet was found equally fit for feeding cows, sheep, and horses; but the sheep must not be suffered to crop it too close. Though no feed was left among the hay, yet it proved nourishing food; and Rocque kept a horse upon nothing else, who, at the time of writing the account, was in good heart, and looked well. He affirmed also, that it cured horses of the distemper called the *grease*, and that by its means he cured one which was thought incurable; but says, it is only the first crop which has this effect.

⁵⁰ Burnet recommended an improper food by Mr Miller and Mr Anderson. This is the substance of Sir James Caldwell's letter to the Dublin Society, at least as to what regards the culture of burnet; and it might reasonably be expected, that a plant, whose use was recommended to the public with so much parade, would soon have come into universal esteem. We were surprised, therefore, on looking into Mr Miller's Dictionary, to find the following words, under the article *Poterium*:—"This plant has of late been recommended by persons of little skill, to be sown as a winter pabulum for cattle: but whoever will give themselves the trouble to examine the grounds where it naturally grows, will find the plants left uneaten by the cattle, when the grass about them has been cropped to the roots; besides, in wet winters, and in strong land, the plants are of short duration, and therefore very unfit for that purpose; nor is the produce sufficient to tempt any person of skill to engage in its culture; therefore I wish those persons to make trial of it in small quantities, before they embark largely in these new schemes."—Mr Anderson, too, in his *Essays on Agriculture*, mentions the produce of burnet being so small, as not to be worth cultivating.

⁵¹ White beet recommended. Upon the authority of Mr Rocque, likewise, the white beet is recommended as a most excellent food for cows; that it vegetates during the whole winter, consequently is very forward in the spring; and that the most profitable way of feeding cows is, to mow this herb, and give it to them green all the summer. It grew in Rocque's garden, during a very great drought, no less than four feet high, from the 30th of May to the 3d of July; which is no more than one month and four days. In summer it grows more than an inch a day; and is best sown in March: a bushel is enough for an acre, and will not cost more than ten shillings. It thrives best in a rich, deep, light soil: the stalks are very thick and succulent; the cows should therefore eat them green.

⁵² Root of Scarcity. Another species of beet (*Beta cicla*), the Mangel Wurzel, or *Root of Scarcity*, as it has been called, has been lately extolled as food both for man and cattle; but, after all, seems only to deserve attention in the latter view. It is a biennial plant; the root is large and fleshy, sometimes a foot in diameter. It rises above the ground several inches, is thickest at the top, tapering gradually downward. The roots are of various colours, white, yellow, and red; but these last are always of a much paler colour than beetrave. It is good fodder for cows, and does not communicate any taste to the milk. It produces great abundance of leaves.

Theory. in summer, which may be cut three or four times without injuring the plant. The leaves are more palatable to cattle than most other garden plants, and are found to be very wholesome. The farmers in those parts of Germany where it is chiefly cultivated, we are told, prefer this species of beet, for feeding cattle, to cabbages, principally because they are not so liable to be hurt by worms or insects; but they think they are not so nourishing as turnips, potatoes, or carrots, and that cattle are not nearly so soon fattened by this root as by carrots, parsnips, or cabbages. It has even been asserted, that this root affords less nourishment than any of those that have been commonly employed for feeding cattle. This does not correspond with the pompous accounts with which the public has been entertained. Upon the whole, however, it is a plant which seems to deserve the attention of our farmers; as on some soils, and in particular circumstances, it may prove a very useful article for the above purposes.

In Mr Anderson's *Essays*, we find it recommended to make trial of some kinds of grasses, which probably would not only answer for fresh fodder during the winter, but might also be cut for hay in summer. This is particularly the case with that species called *sheep's fescue grass*. "I had (says he) a small patch of this grass in winter 1773; which, having been cut in the month of August or September preceding, was saved from that period, and had advanced before winter to the length of five or six inches; forming the closest pile that could be imagined. And although we had about six weeks of very intense frost, with snow; and about other six weeks, immediately succeeding that, of exceeding keen frost every night, with frequent thaws in the day-time, without any snow, during which time almost every green thing was destroyed; yet this little patch continued all along to retain as fine a verdure as any meadow in the month of May; hardly a point of a leaf having been withered by the uncommon severity of the weather. And as this grass begins to vegetate very early in the spring, I leave the reader to judge what might be the value of a field of grass of this kind in these circumstances."

Of another kind of grass, called *purple fescue*, Mr Anderson gives the following character. "It retained its verdure much better than rye-grass during the winter-season; but it had more of its points killed by the weather than the former. It likewise rises in the spring, at least as early as rye-grass."

This ingenious farmer has also made experiments on the culture of these and several other kinds of grasses; which being very well worthy of attention, we shall here insert.

1. *Purple fescue grass*. "Although this grass is very often found in old pastures, yet as it has but few flower-stalks, and as it is greedily eat by all domestic animals, these are seldom suffered to appear; so that it usually remains there unperceived. But it seems to be better able to endure the peculiar acrimony of the dung of dogs than almost any other plant; and is therefore often to be met with in *dog-hills*, as I call the little hills by road-sides where dogs usually piss and dung: and as it is allowed to grow there undisturbed, the farmer may have an opportunity of examining the plant, and becoming acquainted with its appearance.

"The leaves are long and small, and appear to be roundish,

Theory.

roundish, something like a wire; but, upon examination, they are found not to be tubulated like a reed or rush; the sides of the leaf being only folded together from the middle rib, exactly like the strong bent-grass on the sea-shore. The flower-stalk is small, and branches out in the head, a little resembling the wild-oat; only the grains are much smaller, and the ear does not spread full open, but lies bending a little to one side. The stalks are often spotted with reddish freckles, and the tops of the roots are usually tinged with the same colour; from whence it has probably obtained its distinctive name of *Festuca rubra*, or red (purple) fescue.

"It is often to be met with in old garden-walks; and, as its leaves advance very quickly after cutting, it may usually be discovered above the other grasses, about a week or fortnight after the walks are cut. Nor do they seem to advance only at one season, and then stop and decay, like the rye-grass; but continue to advance during the whole of the summer, even where they are not cut; so that they sometimes attain a very great length. Last season (1774), I measured a leaf of this grass, that sprung up in a neglected corner, which was four feet and four inches in length, although not thicker than a small wire. It is unnecessary to add, that these leaves naturally trail upon the ground, unless where they meet with some accidental support; and that if any quantity of it is suffered to grow for a whole season, without being eat down or cut, the roots of the leaves are almost rotted, by the overshadowing of the tops of the other leaves, before the end of the season.

55

Appearance
in its cultivated
state.

"This is the appearance and condition of the plant in its native situation: as it is seldom that it is discovered but in pretty old pastures, and as in that state it carries only a very few seed-stalks, it was with some difficulty that I could collect a small handful of the seed, which I carefully sowed in a small patch of garden-mould, to try if it could be easily cultivated. It came up as quickly as any other kind of grass, but was at first as small as hairs: the leaves, however, advanced apace; and were, before autumn, when the grain with which they had been sowed was cut down, about 16 or 18 inches in length; but having been sown very thin, it was necessary to pick out some other kinds of grass that came up amongst it, lest it might have been choked by them. Early next spring it advanced with prodigious vigour, and the tufts that were formed from every seed became exceeding large; so that it quickly filled the whole ground. But now the leaves were almost as broad as those of common rye-grass, and the two sides only inclined a little towards one another from the mid-rib, without any appearance of roundness. In due time a great many seed-stalks sprung out, which attained very nearly to the height of four feet, and produced seeds in abundance; which may be as easily saved as those of common rye-grass.

"The prodigious difference between this plant in its native and cultivated state amazed me; but it was with a good deal of satisfaction that I found there would be no difficulty of procuring seeds from it; which I had much doubted of at first. It would seem, that nature hath endowed this plant with a strong generative power during its youth, which it gradually loses as it advances in age (for the difference perceived in this case could not be attributed to the richness of the soil); and that, on the contrary, when it was old, the leaves

advanced with an additional vigour, in proportion to the declining strength of the flower-stalks: for the leaves of the young plant seldom exceed two feet, whereas numbers of the old leaves were near four feet in length.

"From these peculiarities in the growth of this plant, it would seem to promise to be of great use to the farmer; as he could reap from a field of it, for the first two or three years, as great a weight of hay as he could obtain from any of the culmiferous grasses (those bearing a long jointed stalk); and, if he meant afterwards to pasture it, he would suffer no inconveniences from the flower-stalks; and the succulent leaves that continue to vegetate during the whole summer, would at all times furnish his cattle with abundance of wholesome food. It has also been remarked, that this grass rises as early in the spring as rye-grass; and continues green for the greatest part of winter, which the other does not. It is moreover an abiding plant, as it seems never to wear out of the ground where it has once been established. On all which accounts, it appears to me highly to merit the attention of the farmer; and well deserves to have its several qualities, and the culture that best agrees with it, ascertained by accurate experiments.

2. "*Sheep's fescue grass*, or *festuca ovina*, is much praised by the Swedish naturalists for its singular value as a pasture-grass for sheep; this animal being represented as fonder of it than of any other grass, and fattening upon it more quickly than on any other kind of food whatever. And indeed, the general appearance of the plant, and its peculiar manner of growth, seems very much to favour the accounts that have been given us of it.

"This plant is of the same family with the former, and agrees with it in several respects; although they may be easily distinguished from one another. Its leaves, like the former, in its natural state, are always rounded, but much smaller; being little bigger than large horse-hairs, or swines-bristles, and seldom exceed six or seven inches in length. But these spring out of the root in tufts, so close upon one another, that they resemble, in this respect, a close hair-brush more than any thing else I know: so that it would seem naturally adapted to form that thick short pile of grass in which sheep are known chiefly to delight. Its flower-stalks are numerous, and sometimes attain the height of two feet; but are more usually about 12 or 15 inches high.

"Upon gathering the seeds of this plant, and sowing them as the former, it was found that they sprung up as quickly as any other kind of grass; but the leaves are at first no bigger than a human hair. From each side springs up one or two of these hair-like filaments, that in a short time send out new off-sets, so as quickly to form a sort of tuft, which grows larger and larger, till it at length attains a very large size, or till all the intervals are closed up, and then it forms the closest pile of grass that it is possible to imagine. In April and May it pushed forth an innumerable quantity of flower-stalks, that afforded an immense quantity of hay; it being so close throughout, that the scythe could scarcely penetrate it. This was allowed to stand till the seeds ripened; but the bottom of the stalks were quite blanched, and almost rotted for want of air before that time.

"This

Theory.

"This was the appearance that it made the first year after it was sowed: but I have reason to think, that, after a few years, it likewise produces fewer seed-stalks, and a greater quantity of leaves than at first. But however that may be, it is certain, that if these are eat down in the spring, it does not, like rye-grass, persist in a continued tendency to run to seed; but is at once determined to push forth a quantity of leaves without almost any stalks at all: and as all domestic animals, but more especially sheep, are extremely fond of this grass, if they have liberty to pasture where it grows, they bite it so close as never to suffer almost a single seed-stalk to escape them; so that the botanist will often search in vain for it, when he is treading upon it with his feet. The best way to discover it in any pasture, is to search for it in winter, when the tufts of it may be easily distinguished from every other kind of grass, by their extraordinary closeness, and the deep green colour of the leaves.

58
What soil
most pro-
per.

"It seems to grow in almost any soil; altho' it is imagined that it would flourish best in a light sandy soil, as it can evidently live with less moisture than almost any other kind of grass; being often seen to remain in the sods that have been employed in coping for stonedikes, after all the other grasses that grew in them have disappeared. It is likewise found in poor barren soils, where hardly any other plant can be made to grow at all; and on the surface of dry worn-out peat-moss, where no moisture remains sufficient to support any other plant whatever: but in neither of these situations does it thrive; as it is there only a weak and unsightly plant, very unlike what it is when it has the good fortune to be established upon a good soil; although it is seldom met with in this last state than in the former.

"I will not here repeat what has been already said about the particular property that this plant possesses of continuing all winter; nor point out the benefits that the farmer may reap from this valuable quality.—He need not, however, expect to find any verdure in winter on such plants as grow upon the loose mossy soil above-mentioned; for, as the frost in winter always hoves up the surface of this soil, the roots of the plants are so lacerated thereby, as to make it, for some time in the spring, to all appearance dead. Nor will he often perceive much verdure in winter upon those plants that grow upon poor hungry soils, which cannot afford abundant nourishment to keep them in a proper state of vegetation at all times: but such plants as grow on earthen dykes, which usually begin to vegetate with vigour when the autumnal rains come on, for the most part retain their verdure at that season almost as well as if they were in good garden-mould.

"I have been very particular in regard to this plant; because, in as far as my observations have yet gone, it promises on many accounts to make a most valuable acquisition to the farmer, and therefore justly demands a very particular share of his attention."

59
Holcus la-
natus.

3. The *holcus lanatus*, or creeping soft-grass of Hudson.—This is considered by our author as one of the most valuable kinds of meadow-grasses; its pile being exceedingly close, soft, and succulent. It delights much in moisture, and is seldom found on dry ground, unless the soil is exceeding rich. It is often found on those patches near springs, over which the water frequently flows; and may be known by the uncommon

softness and succulence of the blade, the lively light green colour of the leaves, and the matted intexture of its roots. But, notwithstanding the softness of its first leaves, when the seed-stalks advance, they are rough to the touch, so that the plant then assumes a very different appearance from what we would have expected. The ear is branched out into a great number of fine ramifications somewhat like the oat, but much smaller.—This kind of grass, however, would not be easily cultivated, on account of a kind of soft membrane that makes the seeds adhere to the stalk, and to one another, after they are separated from it, as if they were intermixed with cobweb, so that it is difficult to get them separated from the stalk, or to spread readily in sowing. It spreads, however, so fast by its running roots, that a small quantity sowed very thin, would be sufficient to stock a large field in a short time.

These are the kinds of grasses, properly so called, which have not as yet been cultivated, that Mr Anderson thinks the most likely to be of value; but, besides these, he recommends the following, of the pea-tribe.

1. *Milk-vetch, liquorice-vetch, or milkwort.* This Milk-vetch plant, in some respects, very much resembles the common white clover; from the top of the root a great number of shoots come out in the spring, spreading along the surface of the ground every way around it; from which arise a great many clusters of bright yellow flowers, exactly resembling those of the common broom. These are succeeded by hard round pods, filled with small kidney-shaped seeds. From a supposed resemblance of a cluster of these pods to the fingers of an open hand, the plant has been sometimes called *ladies-fingers*. By others it is called *crow-toes*, from a fancied resemblance of the pods to the toes of a bird. Others, from the appearance of the blossom, and the part where the plant is found, have called it *feal*, improperly *fell-broom*. It is found plentifully almost every where in old grass-fields; but as every species of domestic animals eat it, almost in preference to any other plant, it is seldom allowed to come to the flower in pasture-grounds, unless where they have been accidentally saved from the cattle for some time; so that it is only about the borders of corn-fields, or the sides of inclosures to which cattle have not access, that we have an opportunity of observing it. As it has been imagined that the cows which feed on these pastures, where this plant abounds, yield a quantity of rich milk, the plant has, from that circumstance, obtained its most proper English name of *milk-vetch*.

One of the greatest recommendations of this plant is, that it grows in poor barren ground, where almost no other plant can live. It has been observed in ground so poor, that even heath, or ling (*erica communis*), would scarcely grow; and upon bare obdurate clays, where no other plant could be made to vegetate; in-somuch that the surface remained entirely uncovered, unless where a plant of this kind chanced to be established; yet even in these unfavourable circumstances, it flourished with an uncommon degree of luxuriance, and yielded as tender and succulent, though not such abundant shoots, as if reared in the richest manured fields. In dry barren sands, also, where almost no other plant could be made to live, it has been found to send out such a number of healthy shoots all round, as

to.

Theory.

60

Milk-vetch

61

Its good
qualities.

Theory. to cover the earth with the closest and most beautiful carpet that can be desired.

The stalks of the milk-vetch are weak and slender, so that they spread upon the surface of the ground, unless they are supported by some other vegetable. In ordinary soils they do not grow to a great length, nor produce many flowers; but in richer fields the stalks grow to a much greater length, branch out a good deal, but carry few or no flowers or seeds. From these qualities our author did not attempt at first to cultivate it with any other view than that of pasture; and, with this intention, sowed it with his ordinary hay seeds, expecting no material benefit from it till he desisted from cutting his field. In this, however, he was agreeably disappointed; the milk-vetch growing the first season as tall as his great clover, and forming exceeding fine hay; being scarce distinguishable from lucerne, but by the slenderness of the stalk, and proportional smallness of the leaf.

Another recommendation to this plant is, that it is perennial. It is several years after it is sowed before it attains to its full perfection; but, when once established, it probably remains for a great number of years in full vigour, and produces annually a great quantity of fodder. In autumn 1773, Mr Anderson cut the stalk from an old plant that grew on a very indifferent soil; and after having thoroughly dried it, he found that it weighed 14 ounces and a half.

The stalks of this plant die down entirely in winter, and do not come up in the spring till the same time that clover begins to advance; nor does it advance very fast, even in summer, when once cut down or eat over: so that it seems much inferior to the abovementioned grasses: but might be of use to cover the worst parts of a farm, on which no other vegetable could thrive.

62
Yellow
vetchling.

2. The common yellow vetchling (*Lathyrus pratensis*), or everlasting tare, grows with great luxuriance in stiff clay soils, and continues to yield annually a great weight of fodder, of the very best quality, for any length of time. This is equally fit for pasture or hay; and grows with equal vigour in the end of summer as in the beginning of it; so would admit being pastured upon in the spring, till the middle, or even the end of May, without endangering the loss of the crop of hay. This is an advantage which no other plant except clover possesses; but clover is equally unfit for early pasture or for hay. Saintfoin is the only plant whose qualities approach to it in this respect, and the yellow vetchling will grow in such soils as are utterly unfit for producing saintfoin.—It is also a perennial plant, and increases so fast by its running roots, that a small quantity of the seed would produce a sufficient number of plants to fill a whole field in a very short time. If a small patch of good ground is sowed with the seeds of this plant in rows, about a foot distance from one another, and the intervals kept clear of weeds for that season, the roots will spread so much as to fill up the whole patch next year; when the stalks may be cut for green fodder or hay. And if that patch were dug over in the spring following, and the roots taken out, it would furnish a great quantity of plants, which might be planted at two or three feet distance from one another, where they would probably overspread the whole field in a short time.

N^o 7.

3. The common blue tare seems more likely than the former to produce a more nourishing kind of hay, as it abounds much more in seeds; but as the stalks come up more thinly from the root, and branch more above, it does not appear to be so well adapted for a pasture-grass as the other. The leaves of this plant are much smaller, and more divided, than those of the other; the stalks are likewise smaller, and grow to a much greater length. Though it produces a great quantity of seeds, yet the small birds are so fond of them, that, unless the field were carefully guarded, few of them would be allowed to ripen.

Theory.
63
Blue tare.

4. The *Vicia sepium*, purple everlasting, or bush vetch. Our author gives the preference to this plant beyond all others of the same tribe for pasture. The roots of it spread on every side a little below the surface of the ground, from which, in the spring, many stems arise quite close by one another; and as these have a broad tufted top covered with many leaves, it forms as close a pile as could be desired. It grows very quickly after being cut or crot, but does not arrive at any great height; so that it seems more proper for pasturage than making hay; altho', upon a good soil, it will grow sufficiently high for that purpose; but the stalks grow so close upon one another, that there is great danger of having it rotted at the root, if the season should prove damp. It seems to thrive best in a clay soil.

64

Bush-vetch.

Besides these, there are a variety of others of the same class, which he thinks might be useful to the farmer.

65

The common garden everlasting pea, cultivated as a flowering plant, he conjectures, would yield a prodigious weight of hay upon an acre; as it grows to the height of ten or twelve feet, having very strong stalks, that could support themselves without rotting till they attained a great height.

66

One other plant, hitherto unnoticed, is recommended by our author to the attention of the farmer; it is the common yarrow (*Achillea millefolium*), or hundred-leaved grass. Concerning this plant, he remarks, that, in almost every fine old pasture, a great proportion of the growing vegetables with which the field is covered consists of it; but the animals which feed there are so fond of the yarrow, as never to allow one seed-stalk of it to come to perfection. Hence these seed-stalks are never found but in neglected corners, or by the sides of roads; and are so disagreeable to cattle, that they are never tasted; and thus it has been erroneously thought that the whole plant was refused by them.—The leaves of this plant have a great tendency to grow very thick upon one another, and are therefore peculiarly adapted for pasturage. It arrives at its greatest perfection in rich fields that are naturally fit for producing a large and succulent crop of grass. It grows also upon clays; and is among the first plants that strike root in any barren clay that has been lately dug from any considerable depth; so that this plant, and thistles, are usually the first that appear on the banks of deep ditches formed in a clayey soil. All animals delight to eat it; but, from the dry aromatic taste it possesses, it would seem peculiarly favourable to the constitution of sheep. It seems altogether unfit for hay.

Achillea
millefolium

Besides these plants, which are natives of our own country, there are others, which, though natives of a foreign climate, are found to thrive very well in Britain; and have been raised with such success by individuals,

67

Lucerne.

Theory. **viduals, as highly to merit the attention of every farmer. Among these the first place is claimed by lucerne.**

This is the plant called *medica* by the ancients, because it came originally from Media, and on the culture of which they bestowed such great care and pains. It hath a perennial root, and annual stalks, which, in good soil, rise to three feet, or sometimes more in height; its leaves grow at a joint like those of clover; the flowers which appear in June, are purple, and its pods of a screw-like shape, containing seeds which ripen in September. All sorts of domestic cattle are fond of this plant, especially when allowed to eat it green, and black cattle may be fed very well with the hay made from it; but an excess of this food is said to be very dangerous.

Lucerne has the property of growing very quickly after it is cut down, insomuch that Mr Rocque has mowed it five times in a season, and Mr Anderson affirms he has cut it no less than six times. It is, however, not very easily cultivated; in consequence of which it sometimes does not succeed; and as it dies entirely in the winter, it is perhaps inferior to the fescue grasses already mentioned, which, tho' despised and neglected, might probably yield as rich a crop as lucerne, without any danger of a miscarriage.

68
Timothy-grass.

Another grass was brought from Virginia, where it is a native, and sown by Rocque in 1763. This grass is called *Timothy*, from its being brought from New-York to Carolina by one Timothy Hanson. It grows best in a wet soil; but will thrive in almost any. If it is sown in August, it will be fit for cutting in the latter end of May or beginning of June. Horses are very fond of it, and will leave lucerne to eat it. It is also preferred by black cattle and sheep; for a square piece of land having been divided into four equal parts, and one part sowed with lucerne, another with saintfoin, a third with clover, and the fourth with timothy, some horses, black cattle, and sheep, were turned into it, when the plants were all in a condition for pasturage; and the timothy was eaten quite bare, before the clover, lucerne, or saintfoin, was touched.

One valuable property of this grass is, that its roots are so strong and interwoven with one another, that they render the wettest and softest land, on which a horse could not find footing, firm enough to bear the heaviest cart. With the view of improving boggy lands, therefore, so as to prevent their being poached with the feet of cattle, Mr Anderson recommends the cultivation of this kind of grass, from which he has little expectation in other respects.

SECT. VII. Of the Diseases of Plants.

THESE are divided by Tournefort into the following classes. 1. Those which arise from too great an abundance of juice; 2. From having too little; 3. From its bad qualities; 4. From its unequal distribution; and 5. From external accidents.

69
Effects of too great an abundance of juices.

Too great an abundance of juices cause at first a prodigious luxuriant growth of the vegetable; so that it does not come to the requisite perfection in a due time. Wheat is subject, in some climates, to a disease of this kind; it vegetates excessively, without ever carrying ripe grain; and the same disease may be artificially produced in any grain, by planting it in too rich a soil. Too much rain is apt likewise to do the same. When a vegetable is supplied too abundantly with juice.

VOL. I. Part I.

Theory. ces, it is very apt to rot; one part of it overshadowing another in such a manner as to prevent the access of fresh air; upon which putrefaction soon ensues, as has been already observed with regard to the fescue grasses.

In grass, or any herbaceous plant, where the leaves ⁷⁰ are only wanted, this over luxuriance cannot be called grain. a disease, but is a very desirable property; but in any kind of grain it is quite otherwise. Dr Home, in his Principles of Agriculture and Vegetation, classeth the *smut* in grain among the diseases arising from this cause. He is of opinion, that too great an abundance of juices in a vegetable will produce diseases similar to those occasioned by repletion in animal bodies; viz. stagnations, corruptions, varices, cariofities, &c. along with the too great luxuriance we have just now mentioned, which he expresses by "too great an abundance of water-shoots." Hence he is induced to class the smut among diseases arising from this cause; it being a corruption happening most in rainy seasons, and to weak grain.—Like other contagious diseases, he tells us, the smut may be communicated from the infected to healthy grain. As a preventative, he recommends steeping the grain in a strong pickle of sea-salt. Besides the effect which this has upon the grain itself, it is useful for separating the good from the bad; the best seed falling to the bottom, and the faulty swimming on the top of the liquor.—For the same purpose, a ley of wood-ashes and quicklime is recommended by some; and, by others, a solution of saltpetre or copperas; after which the grain is to be dried with slacked lime or dry turf ashes. This solution, however, we can by no means recommend, as it seems most likely to kill the grain entirely.

According to Dr Home, dung is a preventative of ⁷² diseases arising from too great moisture; in confirmation of which, he relates the following experiment. "Two acres of poor ground, which had never got any manure, were sowed with a design to be sown with wheat; but the scheme being altered, some dung was laid on a small part of it, and the whole sowed, after it had got five furrows, with barley. A great quantity of rain fell. The barley on that part which was dunged was very good; but what was on the rest of the field turned yellow after the rains, and when ripe was not worth the reaping."

The want of nourishment in plants may be easily ⁷³ known by their decay; in which case, the only remedy is, to supply them with food, according to the methods we have already directed, or to remove from their neighbourhood such other plants as may draw off the nourishment from those we wish to cultivate.—In the Memoirs of the Academy of Sciences for 1728, Mr Du Hamel mentions a disease, which he calls *le mort*, that attacks saffron in the spring. It is owing to another plant, a species of trefoil, fixing some violet-coloured threads, which are its roots, to the roots of the saffron, and sucking out its juice. This disease is prevented by digging a trench, which saves all the unaffected.

The bad qualities, or unequal distributions, of the ⁷⁴ juices of plants, are the occasion of so few of the diseases to which vegetables in this country are subject, that by insects, we forbear to mention them at present. Most of the diseases of our plants are owing to external accidents, particularly to the depredations of insects.—The insects by which the greatest devastations are committed in this country are, snails, caterpillars, grubs, and flies. The snails and caterpillars feed on the leaves and young shoots;

L 1

Theory. shoots; by which means they often totally destroy the vegetable. Where the plants are of early access, these vermin may be destroyed by sprinkling the vegetable with lime-water; for quicklime is a mortal poison to creatures of this kind, and throws them into the greatest agonies the moment they are touched with it. On trees, however, where this method cannot so well be followed, fumigation is the most proper; and, for this purpose, nothing is better than the smoke of vegetables not perfectly dry. In some cases the eggs of these destroying creatures may be observed, and ought without doubt immediately to be taken away. On the fruit-trees, as apples, pears, medlars, on some forest-trees, the oak and dwarf-maple especially, and the white and black thorn in hedges, a kind of little tufts are to be observed, resembling, at first sight, withered leaves twisted by a cobweb, about the uppermost twigs or branches. These contain a vast number of little black eggs, that in the spring produce swarms of caterpillars which devour every thing. To prevent this, all the twigs on which these cobwebs appear should be taken off and burnt as soon as possible. This ought to be done before the end of March, that none of the eggs be allowed sufficient time for hatching.

75
Insects destroyed by lime-water.

76
Grubs.

The grubs are a kind of worms which destroy the corn by feeding upon its roots; they are transformed every fourth year into the beetles called *cock-chaffers*, *may-bugs*, &c. they are very destructive when in their vermicular state, and cannot then be destroyed because they go deep in the ground. When become beetles, they conceal themselves under the leaves of trees, where they seem asleep till near sun-set, when they take their flight. It is only now that they can be destroyed, and that by a very laborious method; namely, by spreading pack-sheets below the trees in the day-time when the beetles are in their torpid state, then shaking them off and burning them. Some time ago they made such devastations in the county of Norfolk, that several farmers were entirely ruined by them; one gathered 80 bushels of these insects from the trees which grow on his farm. It is said, that in 1574 there fell such a multitude of these insects into the river Severn, that they stopped and clogged the wheels of the water-mills.

77
Turnip-fly.

Turnips, when young, are apt to be totally destroyed by a multitude of little black flies, from thence called the *turnip-fly*. As a preventative of these, some advise the seed to be mixed with brimstone; but this is improper, as brimstone is found to be poisonous to vegetables. The best method seems to be the fumigation of the fields with smoke of half-dried vegetables. For this purpose weeds will answer as well as any. This fumigation must no doubt be often repeated, in order to drive away the innumerable multitudes of these insects which are capable of destroying a large field of turnip.

78
Prevented by fumigation, &c.

Some have supposed that the fly is either engendered in new dung, or enticed by it; and have therefore advised the manure to be laid on in the autumn preceding, by which it loses all its noxious qualities, while its nutritive ones are retained, notwithstanding these might be supposed liable in some degree to be exhaled by the sun. This method is said to have been ascertained by experiments; and it is added, that another material advantage accruing from autumn manuring for

turnips is, that all the seeds contained in the dung, and which of course are carried on the land with it, vegetates almost immediately, are mostly killed by the severity of the winter, and the few that remain seldom avoid destruction from the plough-share.

The following method of sowing has also been recommended as a preventative of the fly:—"About Midsummer, take the first opportunity when it rains, or there is an apparent certainty of rain approaching, to sow your turnip seed; if about the full moon, the better. In this case, neither harrow, brush, nor roll, after sowing. The natural heat of the ground at that season, and the consequent fermentation occasioned by copious rain, will give an astonishingly quick vegetation to the seed, which in a few days will be up and out of all danger from the fly. At all events, sow not till it rains; it is better to wait a month, or even longer, for rain, than to sow (merely for the sake of sowing about the usual time) when the ground is parched with heat. By the scorching of the sun, the oil and vegetative quality of the seed are exhausted; and the few weak plants that come up will be destroyed by the fly before they can attain strength to put forth their rough leaves. The fly infests the ground abundantly in dry hot weather, but do no injury in rain. The falling rain will sufficiently wash the turnip seed into the ground without harrowing it in; which, instead of merely covering, too often buries this small seed at so great a depth, as never afterwards to get above ground."

79
Various remedies against the turnip-fly.

The following remedies are also recommended as having often proved successful:—A small quantity of foot sown over the land at their first appearance. Branches of elder, with the leaves bruised, drawn in a gate over them. Musk mixed with the seed before it is sown. And sulphur burnt under it, after moistening it with water in which tobacco has been steeped.

But showers on the plants as soon as they appear above ground, are esteemed the best preservatives. They enfeeble and kill the fly, and hasten the plants into the rough leaf, in which state they are out of danger.

The sweet smell of the turnip has been thought to attract the fly; upon which supposition, the remedy appeared to consist in overpowering that smell by one which is strong, fetid, and disagreeable. Hence it has been recommended, that upon an acre of turnips sown in the usual way, a peck or more of dry foot be thrown after the ground is finished, and in as regular a way as he sows the seed.

Some time ago an insect, called the *corn-butterfly*, committed such ravages while in its vermicular state, in France, that upwards of 200 parishes were ruined by it; and the ministry offered a reward to the discoverer of an effectual remedy against this destroying worm. The cure which was at last discovered was, to heat the corn in an oven so much as not to destroy its vegetative power, but sufficiently to destroy the small worms which made their nest in the substance of the grain, and at last eat out the substance so completely, that nothing could be got from the husk even by boiling it in water. It is certain, that though insects can bear a great deal of cold, they are easily destroyed by a slight degree of heat; nor is the vegetative power of corn easily destroyed, even when kept for a long time in a pretty strong heat. This method must therefore be very effectual for destroying all kinds of insects.

80
Corn-butterfly.

Theory. insects with which grain is apt to be infected: but care must be taken not to apply too great a heat; and the adjusting of the precise degree necessary to destroy the insect, without hurting the corn, will be attended with some difficulty.

81
The curled disease in potatoes. The curled disease in potatoes has long been a subject of investigation and experiment among farmers: and the knowledge of its cause and cure seems yet to remain a desideratum. The Agriculture Society at Manchester, a few years ago, offered a premium for discovering by actual experiment the cause of the disease in question; and a great variety of letters were, in consequence, addressed to them upon the subject.—As these contain many interesting observations both on the disease itself and the best methods hitherto adopted for preventing it, the following abstract of them may not improperly be introduced in this place.

82
Various methods of prevention. I. According to the writer of the first letter, this disease is caused by an insect produced by frost or bad keeping before setting; and the newest kinds, such as have been raised within these nine or ten years, are most apt to curl, because they will not stand to be kept in winter and spring before setting, as the old kinds will. In autumn 1776, he got up a bed of potatoes to lay by in winter, leaving plenty in the ground as regular as possible; and, before the severity of winter came on, covered part of the bed with straw and pease-haulm, and left the other part of the bed uncovered. That part of the bed which was covered was quite free from curled ones; but the uncovered part produced a great many curled, owing, as the writer says, to frost and severity of the weather.

II. This writer had about a quarter of an acre of potatoes, well manured with cow and horse dung, and took the greatest care in picking the fine smooth-skinned potatoes for sets; yet nine out of ten parts were curled. He attributes the cause of this disease to a white grub or insect, which he found near the root, about half an inch long, with eight or ten legs, its head brown and hard; as upon examining a number of the curled roots, he found them all bitten, chiefly from the surface to the root, which of course stopped the progress of the sap, and threw the leaf into a curl. The uncurled roots were not bitten. He tried a few experiments as follow:—First, he put foot to the insects in the rows for two days; and after that, he put lime to them for the same time, but they still kept lively; next he put a little salt, which destroyed them in a few hours. From which he infers, that if coarse salt were put into the ground at the time the land is preparing for potatoes, it would effectually cure this distemper.

III. In this letter, the cause of the disease is attributed to the method of earthing the stems while in cultivation; and the branch, striking root into the new earthed-up soil, it is said, produces potatoes of such a nature as the year following to cause the disease complained of.

To prevent the disease, it is recommended to take the sets from those potatoes that have not bred any from the branch covered; or otherwise, to dig the part the sets are to be raised from.

IV. According to this writer, the disorder proceeds from potatoes being set in old-tilled or worn-out ground; for though those potatoes may look tolerably well, yet their sets will most, if not all, produce curled potatoes.

Hence he is convinced, that no sets ought to be used from old-tilled or couch-grass land; and that, in order to have good sets, they should be procured from land that was purposely fallowed for them; from fresh ley land, where they are not curled; or from ley land that was burnt last spring. He directs to plant them on virgin mould, and the potatoes will have no curled ones amongst them; and to keep them for winter, from any other kind.

To avoid the uncertainty of getting good sets, he recommends crabs to be gathered from potatoes growing this year on fresh land free from curl, and the next spring to sow them on fresh ley land; and continue to plant their sets on fresh ley land yearly, which he is convinced will prevent the curl.

All the good potatoes he saw this year, either on fresh ley land or on old-tilled land, were raised from sets that grew upon fresh ley land last year; and where he has seen curled potatoes, he found, upon inquiry, the potato-sets grew upon old-tilled and worn-out land last year. He gives as a general reason for the disorder, that the land is oftener cropt than it had used to be, much more corn being now raised than formerly.

V. In 1772, this writer planted some potatoes by accident full nine inches deep: when taken up, many of the plants were rotted, and a few curled. He kept the whole produce for seed, and planted two acres with it in 1773, not quite six inches deep. The crop was amazingly great; and he did not observe any curled plants among them. In 1774, many of these were planted in different soils; yet they were so infected with the curled disease, that not one in twenty escaped. In 1775, the complaint of this disease became general. In 1776, it occurred to him that the good crop of 1773 was owing to the accidental deep setting of 1772; and that the reason why the same seed became curled in 1774, was their being set so near the surface in 1773; and attributes the disease to the practice of ebb-setting. In 1777, he took some potatoes from a crop that was curled the year before, and after cutting the sets, left them in a dry room for a month. Half were planted in ground dug fourteen days before; the other half, having been steeped in a brine made of whitster's ashes for two hours, were also planted in the same land at the same time. The steeped ones came up ten days before the others, and hardly any missed or were curled. The unsteeped ones generally failed, and those few that came up were mostly curled.

He therefore advised as a remedy, 1. That the potatoes intended for next year's sets be planted nine inches deep. 2. That they remain in the ground as long as the season will permit. 3. That these sets be well defended from frost till the beginning of March. 4. That the sets be cut a fortnight before planting. 5. That they be steeped, as above, two hours in brine or ley. 6. That the dung be put over the sets. And 7. That fresh sets be got every year from sandy soils near the coast, or on the shore.

P. S. At planting, the hard dry sets should be cast aside, for they will probably be curled. Curled potatoes always proceed from sets which do not rot or putrefy in the ground.

VI. This writer had five drills of the old red potatoes, and four of the winter whites, growing at the same time in the same field. The drills were prepared

Theory.

exactly alike. Among the red not one was curled; the winter whites were nearly all curled. He says he has found by experience, that the red never curl.

VII. Two of the writer's neighbours had their sets out of one heap of potatoes. They both set with the plough, the one early, and the other late, in the season. Most of those early set proved curled, and most of those set late smooth; the latter on clay land.

A few roods of land were also planted with small potatoes, which had lain spread on a chamber-floor all the winter and spring till the middle of May. They were soft and withered; they proved smooth and a good crop. Middle-sized potatoes, withered and soft, which had been kept in a large dry cellar, and the sprouts of which had been broken off three times, produced also a smooth good crop.

Hence he was led to think a superfluity of sap, occasioned by the seed being unripe, might cause the disease. To be satisfied in this, he asked the farmer whether he had set any of the same potatoes this year, and what was the nature of his land? He told him "he had; that they had been set on his farm fourteen years without ever curling; that his soil was a poor whitish sand, of little depth; that he let those he designed for keeping grow till they were fully ripe."

Hence he concludes, the only sure way to prevent the curl is, to let potatoes intended for seed stand till they are fully ripe, and to keep them dry all winter.

VIII. This writer set a quantity of the red potatoes, without having a curled one amongst them. His method is, when the sets are cut, to pick out such as are reddest in the inside. On digging them up at Michaelmas, he mixes none of the curled seed among the others. The curled are easily distinguished, by their stalks withering two months before the rest of the crop.

The cause of the curled disease he attributes to potatoes being of late years produced from seed instead of roots, as formerly. Such will not stand good more than two or three years, use what method you please. Last spring, he set the old red and white russels, and had not a curled potato amongst them.

On the lime-stone land about Denbigh, in North Wales, they have no curled potatoes. If this be owing to the nature of that land, perhaps lime might prevent the disease.

IX. According to this writer, all sorts of grain wear out and turn wild if sown too long on the same land; the same will hold good in all sorts of pulse, pease, beans, and (as he conceives) potatoes. It generally happens, that those who have most curled potatoes plant very small sets.

Eleven years ago he bought a parcel of fresh sets, of the golden-dun kind, and has used them without change to the present year, without any being curled. This he principally attributes to his having always planted good large sets.

About four years since, he thought of changing his sets, as his potatoes were too smooth, too round, and much diminished in size. But the curl at that time beginning to be very alarming, he continued his sets till part of his crop missing last year, he was obliged to buy new sets this spring, which, being small, were curled like other peoples.

He allows, that the curl has frequently happened to persons who have used large potatoes for sets; for, as all roots are not equally affected, some curled ones may be mixed with the rest.

To prevent the evil, cut your sets from clear and middle-sized potatoes, gathered from places as clear of the curl as possible; preserve them as usual till spring. If any are harder, or grass more in cutting than usual, cast them aside. He would also recommend the raising a fresh sort from the crab produced on the sorts least affected, which in Lancashire are the long-duns.

X. Set potatoes with the sprits broke off, and they will (says the writer of this letter) be curled ones; if set with the sprits on, they will not be curled. Again, take a potato which is sprit, and cut a set off with two fights: break one sprit off, and let the other stay on, and set it; the former will be curled, and the latter will not.

When you have holed your potatoes, take them out before they are sprit, and lay them dry until you have set or sown them, and you will have no curled potatoes.

XI. This writer was at the expence of procuring sets at fifty miles distance, and where this disease was not known. The first year's trial was successful; the year following he procured sets from the same place, but one-fifth of his crop was infected. By way of experiment, he planted sets from roots which had been infected the year before, and some of these produced healthy plants, free from all infection.

As every effect must have a cause, he supposed it might be some insect, which, living on the leaves, gave them that curled and sickly appearance, as is the case in the leaves of many shrubs and trees. But whether the insect is lodged in the old sets, and to be destroyed at the time of planting, or, proceeding from some external cause, can only be destroyed afterwards, he is not yet certain, although he has made the following experiments.

On a piece of ground that had not been dug for 20 years, he planted four rows of sets, which he knew to be perfectly clear; the drills were two feet distant, the sets one foot distant in each drill. He then planted on the same ground four rows with sets from curled potatoes, at equal distances; in each row were about 20 sets.

Lot 1st, the curled state.

N ^o 1. Without manure,	N ^o 3. In foot,
2. In salt,	4. In quicklime.

Lot 2d, the clear sets.

N ^o 1. Without manure,	N ^o 3. In foot,
2. In salt,	4. In quicklime.

Those planted in salt and foot in both lots were destroyed. In lot 1. n^o 1. and 4. all curled. Lot 2. n^o 1. and 4. quite clear.

This experiment was made on a supposition that the insect lodged in the set, and must be destroyed on planting. But of that he is not fully satisfied. He repeated salt, foot, and quicklime, on the branches of several curled potatoes. Salt destroyed all he touched with it. Lime and foot had, he thought, a partial effect on the plants. After some time, they appeared almost as healthy as the rest. Thus, although he had done little towards the cure, he flatters himself he has

Theory. pointed out the cause, the insects on the curled plants being not only very numerous, but visible to the naked eye.

XII. This writer ascribes the cause of the disease to the frost, and bad keeping in winter and spring before setting. They are liable to be damaged by frost after they are set, but this may be prevented by covering. If it be asked, why frost did not injure them formerly? he answers, it is only the new kinds which are apt to curl. To this may be added, that less care is now taken of the seed than formerly. To prevent the latter, let them remain in the ground covered with haulm or litter till the time they are wanted for setting; and, in case no frost touches them afterwards, they will be free from the disease.

XIII. This writer says, the red potato was as generally planted as the winter-white and the Lincolnshire kidney are now. The first, being a later potato, did not sprout so early as the others. The white sprout very early, and therefore should first be moved out of the place where they have been preserved in the winter. Instead of that, they are often let remain till their roots and sprouts are matted together. On separating them, these sprouts are generally rubbed off, and they are laid by till the ground is ready; during which interval they sprout a second time: but these second sprouts, being weak and languid, will shrink, sicken, and die; and the fruit at the roots will be small, hard, ill shaped, and of a brown colour.

Now, if putting off the sprouts once or more, before the sets are put in the ground, be the cause (as he verily believes it is) of the curled disease, an easy remedy is at hand. When the potatoes intended for sets are dug up, lay them in a west aspect as dry as possible: in such a situation they will not sprout so soon. The best time for removing most sorts, is the first fine day after the 24th of February. Cut them into sets as soon as possible, and let them remain covered with dry sand till the ground is prepared, which should be a winter fallow. Lay the sets in without breaking off any of the sprouts, for the second will not be so vigorous. This accounts for one sprout out of three from the same set being curled. The two stems not curled rose from two later eyes, and were first sprouts. The sprout curled was a second, the first having been rubbed off.

XIV. This writer says, that last spring one of his neighbours cut and set, in the usual way of drilling, some loads of the largest potatoes he could procure; and more than half of them proved curled. Being a few sets short of the quantity wanted, he planted some very small potatoes which he had laid by for the pigs. These being fully ripe and solid, there was not a curled plant among them. He apprehends, the others being curled was owing to their not being fully ripe. A crop of potatoes, set this year in rows on ground that had borne a crop of them last year, were mostly curled; but many plants came up from seed left in the ground last season, and there was not a curled one among them.

XV. Of late years, this writer says, great improvements have been made in setting potatoes and cutting the sets. The ground is dressed cleaner and dunged stronger. Many people, in drilling, wrap up the sets entirely in the dung; by which means, though their

potatoes are larger, the disease seems to be increased. They also cut their sets out of the richest and largest potatoes, which is perhaps another cause of this evil. In cold countries, where they set their own seed, which has grown on poor land, with less dung, they have no curled plants. On the contrary, when they bought rich and large potatoes for seed, they have been curled in great quantities. He believes, the richness and largeness of the seed to be the cause of the evil; for he does not remember to have seen a curled stem which did not spring from a set of a large potato.

XVI. This writer apprehends the curled disease in potatoes to proceed from a defect in the *planta seminalis*, or seed-plant; and from comparing curled ones with others, there appeared to be a want of, or inability in, the powers of expanding or unfolding the parts of the former; which, from this defect, forms shrivelled, starved, curled stems. On examining some of the sets at the time of getting the crop, he found them hard and undecayed; so hard, indeed, that some of them would not be soft with long boiling. This led him to think, that some manures might have the same effect on them as tanners ooze has on leather, and so harden them, that the embryo plant could not come forth with ease; but a closer examination taught him otherwise, and that they grow equally in all manures.

Some have thought that the fermentation is occasioned by too great quantities being heaped together; but the writer has seen an instance, wherein a single potato, preserved by itself, when set, produced stems of the curled kind. He thinks the most consistent and rational opinion is, that the disease is occasioned by the potatoes being taken from the ground before the stamen, or miniature-plant, is properly matured and ripened.

For let it be observed, that the potato, being a native of a warmer climate, has there more sun, and a longer continuance in the ground, than in its present exotic state; consequently, it has not the same natural causes here to mature the seed-plant as in its native state. We ought, therefore, to give all the opportunities our climate will admit for nature to complete her work, and fit the stamen for the next state of vegetation, especially in those intended for seed. But if the potato be taken up before the seed-plant be fully matured, or the air and sap-vessels have acquired a proper degree of firmness or hardness, it must, when thus robbed of further nutrition, shrivel up; and when the vessels, in this immature state, come to act again in the second state of vegetation, they may produce plants which are curled.

If it be asked, why are they more common now than formerly? he answers, that before the present mode of setting them took place, people covered them, while in the ground, with straw, to protect them from frost.

If it be asked, why one set produces both curled and smooth stems? he answers, we suppose every eye to contain a *planta seminalis*; that all the embryos, or seed plants, contained in one potato, are nourished by one root; that, as in ears of corn, some of these seed-plants may be nourished before others.

One of his neighbours, last year, set two rows of potatoes,

Theory.

Theory.

potatoes, which proving all crusted, he did not take them up; and this year there is not a curled one among them. Such potatoes, therefore, as are designed for seed, should be preserved as long in the ground as possible.

XVII. This writer advises such sets to be planted as grow in moss-land; and, he says, there will not be a single curled one the first year. This is affirmed by the inhabitants of two townships, where they grow amazing quantities.—A medical gentleman sowed last year two bushels of sets from one of the above places, and had not one curled; but on sowing them again this year, he had a few.

Notwithstanding there seems to be a diversity of opinions in the above writers, occasioned by the different appearances of their crops, and the seemingly contrary effects of the means used to prevent or cure the disease, we conceive that the following general propositions may be fairly drawn from the whole.

1. That some kinds of potatoes are (*cæteris paribus*) much more liable to be affected by the disease than the rest; and that the old-red, the golden-dun, and the long-dun, are the most free from it.—2. That the disease is occasioned by one or more of the following causes, either singly or combined: 1st, By frost, either before or after the sets are planted: 2d, From planting sets out of large unripe potatoes: 3d, From planting too near the surface, and in old worn-out ground: 4th, From the first shoots of the sets being broken off before planting; by which means there is an incapacity in the *planta seminalis* to send forth others sufficiently vigorous to expand so fully as they ought.—3. That the most successful methods of preventing the disease, are cutting the sets from smooth middle-sized potatoes, that were fully ripe, and had been kept dry after they were taken out of the ground; and without rubbing off their first

shoots, planting them pretty deep in fresh earth, with a mixture of quicklime, or on lime-stone land.

A correspondent of the Bath Society is convinced, that, whatever may be its cause, the fault itself is inherent in the seed; and has communicated the following method of avoiding it: “I made a hot-bed in the following manner (which method I have used ever since): I laid horse-dung, &c. (as is generally used in making hot-beds), about 18 inches thick; over which I spread a layer of fine rich mould about four or five inches thick: upon the top of this mould I laid, in different divisions, a certain number of potatoes of various sorts, some of my own growth, and others bought from different parts, and covered these lightly over with more mould; they soon came up. I then observed which was freest from the blight or curl; for if there were not more than one defective in *forty* or *fifty*, I concluded I might set of that sort with safety. This method I have now practised near twelve years, and never lost my crop, or any part thereof worth mentioning; whilst my neighbours, who followed the old method, were frequently disappointed in their crops; and to the best of my knowledge, all those of my neighbours who have of late been persuaded to take the trouble of using the same means as myself, have never failed of success to their utmost wishes in one instance; nor do I ever think it will fail, if duly attended to; the fault being some hidden cause in the seed unknown at present, and I believe incurable by any means, at least which have yet come to my knowledge. My reason for planting my hot-beds so soon is, that if the frost hinders the first experiment, or they all prove bad, I may have time to make a second or third if necessary, with different sorts of seed, before the proper season arrives for planting in the fields and grounds appointed for the great and general crop.”

Theory.

PART II. PRACTICE OF AGRICULTURE.

SECT. I. *Instruments of Husbandry.*

THE instruments employed in agriculture are various; as the plough, the harrow, the roller, &c. which are again greatly diversified by various contrivances adapted to particular uses.

1. OF PLOUGHS.

83
Scots
plough.

THE plough constructed in the following manner is still the most common and the most generally understood in Scotland; and, if properly made, is the best for answering all purposes, when only one is used; though others are, perhaps, more proper on some particular occasions.

84
Description
of the Scots
plough.

The parts of which this plough is composed, are, the head, the beam, the sheath, the wrest, the mouldboard, the two handles, the two rungs, the sock, and the coulter; the two last are made of iron, and all the rest of wood.

Plate IV.
fig. 1.

The HEAD is designed for opening the ground below. The length of the head from A to B is about 20 inches, and the breadth from A to D about five inches; C is the point upon which the sock is driven, and the length from B to C is about six inches; *a* is the mortoise into which the larger handle is fixed, and *b* is the mortoise into which the sheath is fixed.

The head is that part of the plough which goes in the ground; therefore the shorter and narrower it is, the friction will be the less, and the plough more easily drawn; but the longer the head is, the plough goes more steadily, and is not so easily put out of its direction by any obstructions that occur. Twenty inches is considered as a mean length; and five inches as the most convenient breadth.

The SHEATH, E, is driven into the mortoise *b*, and thus fixed to the head AB. It is not perpendicular to the head, but placed obliquely, so as to make the angle formed by the lines AB and EB about 60 degrees. The sheath is about 13 inches long, besides what is driven into the mortoise *b* (fig. 1.); about three inches broad, and one inch thick.

The sheath is fixed to the mould-board, as in fig. 11. Fig. 3. E, in the same manner as the wrest is fixed to the head in fig. 7.

The MOULD-BOARD, is designed to turn over the earth of the furrow made by the plough; and it is obvious, that, according to the position of the sheath, the mould-board will turn over the earth of the furrow more or less suddenly. Besides, when it forms a less angle with the head than 60 degrees, the plough is in great danger of being *choked*, as the farmers term it.

Practice.

Fig. 3.

The Larger HANDLE, FA, is fixed to the head, by driving it into the mortoise *a* (fig. 1.). It is placed in the same plane with the head; and its length from AF is about five feet four inches; and its diameter at the place where it is fixed to the beam is about two inches and an half, and tapers a little to the top F. About ten inches from A, there is a curve in the handle, which, when F is raised to its proper height, makes the lower part of it nearly parallel to the sheath E B. This curve is designed to strengthen the handle. The proper position of the handle is, when the top F is about three feet two inches higher than the bottom of the head AB.

The longer the handles, the plough is the more easily managed, because the levers are more distant from the centre of motion. The higher the top of the handles, the plough is more easily raised out of the ground, provided they be no higher than the lower part of a man's breast.

Fig. 4.

The BEAM, is fixed to the larger handle and the sheath, all of which are placed in the same plane with the head. The length of it, from H to I, is about six feet; its diameter is about four inches. When the plough is in the ground, the beam should be just high enough not to be incommoded by any thing on the surface.

The position of the beam depends on the number of cattle in the plough. When two horses are yoked, the beam should be placed in such a manner as to make the perpendicular distance betwixt the bolt-hole of the beam and the plane of the head about 21 inches; when four horses are yoked, two a-breast, this distance should only be about 18 inches.

Fig. 5.

The SOCK, BP, is fixed to the end of the head, and is about two feet long. In fitting the sock to the head, the point ought to be turned a little to the land or left side; because otherwise it is apt to come out of the land altogether. When turned to the left, it likewise takes off more land; when turned upwards, the plough goes shallow; and when downwards, it goes deeper.

Fig. 6.

The COULTER, is fixed to the beam, and is about two feet ten inches long, two inches and a half broad, sharp at the point and before, and thick on the back, like a knife. It is fixed and directed by wedges, so as to make the point of it equal to, or rather a little before, the point of the sock and upon a line with the left side of the head. This oblique position enables it to throw roots, &c. out of the land, which requires less force than cutting or pushing them forward.

Fig. 7.

The WREST, BD, is fixed to the head, and is about 26 inches long, two broad, and one thick. It is fixed to the head at B, in such a manner as to make the angle contained between the lines AB and BD about 25 degrees. The wrest is seldom or never placed in the same plane with the head, but gradually raised from the place where it is fixed to it; that is, from B to K, as in fig. 8. The position of the wrest determines the nature of the furrow. When the wrest is wide and low set, the furrow is wide; and when it is narrow and high set, the furrow is narrow.

Fig. 9. represents the two HANDLES, fixed together by the two rungs. The larger handle has already been described; the lesser one is a few inches shorter, and does not require to be quite so strong. The distance of the handles at the little rung depends on the position of the wrest. Their distance at M and P is about two

feet six inches. The lesser handle is fixed to the mould board at M, fig. 10. and to the wrest KB, at L.

Practice.

Fig. 11. represents the plough complete, by joining together figures 6. and 10. in the sheath E B. The wrest BK is supposed to make an angle with the head AB as in fig. 7. and the handles joined together as in fig. 9.

After having given such a particular description of all the parts and proportions of the Scots plough, it will easily appear how it separates, raises, and turns over the earth of the furrow. If it had no coulter, the earth would open above the middle of the sock, and in a line before the sheath; but as the coulter opens the earth in a line with the left side of the head, if the soil has any cohesion, the earth of the furrow will be wholly raised from the left side, and, as the sock moves forward, will be thrown on the right side of the sheath, and by the casting out of the mould-board, or the raising of the wrest, will be turned over.

The BRIDLE, or MUZZLE, is another article belonging to the plough. It is fixed to the end of the beam, and the cattle are yoked by it. The muzzle commonly used is a curved piece of iron, fixed to the beam by a bolt through it. A B'C is the muzzle, A C the bolt by which it is fixed to the beam; D is the swingle-tree or cross-tree, to which the traces are fixed; and B is a hook or cleek, as it is commonly called, which joins the muzzle and swingle-tree.

Some use another kind of muzzle, A B C D. It is fixed to the beam by two bolts, and has notches by which the cleek of the swingle-tree may be fixed either to the right or the left of the beam. There are also different holes for the hind-bolt to pass thro', by which the draught may be fixed either above or below the beam. A D is the fore-bolt upon which the muzzle turns; on B C are four notches, betwixt any two of which the cleek of the swingle-tree may be fixed. When the cleek is fixed at B, the plough is turned towards the firm land, and takes off a broader furrow; and when fixed at C, it is turned towards the ploughed land, and takes off a narrower furrow. E and F are the holes on each side thro' which the hindmost bolt passes. When the bolt is put thro' the highest two, these holes being thereby brought to the middle of the beam, the fore-part of the muzzle is raised above the beam, and the plough is made to go deeper; and when put through the lowest two, the fore-part of the muzzle is sunk below the beam, and the plough is made to go shallower. This muzzle may be so constructed as to have the same play with the common one. A is the end of the beam; B a plate of iron sunk into it, and, with a similar one in the other side, is rivetted into it by bolts; C is the muzzle fixed to these plates of iron by the bolt D, which bolt may be put through any of the holes E E. From the construction of this muzzle it is plain, that it has the same play with the common one, and that by it the land of the plough may be altered at pleasure.

Of all forms, that of the Scotch plough is the fittest for breaking up stiff and rough land, especially of the Scots where stones abound; and no less fit for strong clays hardened by drought. The length of its head gives it a firm hold of the ground; its weight prevents it from being thrown out by stones; the length of the handles gives the ploughman great command to direct its motion;

Practice.

tion; and by the length of its head, and of its mould-board, it lays the furrow-slice cleverly over. This plough was contrived during the infancy of agriculture, and was well contrived: in the soils above described, it has not an equal.

86
In what soil
improper.

But in tender soil it is improper, because it adds greatly to the expence of ploughing, without any counterbalancing benefit. The length of the head and mould-board increases the friction, and consequently it requires a greater number of oxen or horses than are necessary in a shorter plough. There is another particular in its form that resists the draught: the mould-board makes an angle with the sock, instead of making a line with it gently curving backward. There is an objection against it no less solid, that it does not stir the ground perfectly: the hinder part of the wrest rises a foot above the sole of the head; and the earth that lies immediately below that hinder part, is left unstirred. This is ribbing land below the surface, similar to what is done by ignorant farmers on the surface.

These defects must be submitted to in a soil that requires a strong heavy plough; but may be avoided in a cultivated soil by a plough differently constructed. Of all the ploughs fitted for a cultivated soil free of stones, that introduced into Scotland about 20 years ago, by James Small in Blackadder Mount, Berwickshire, is the best. It is now in great request; and with reason, as it avoids all the defects of the Scots plough. The shortness of its head and of its mouldboard lessen the friction greatly: from the point of the sock to the back part of the head it is only 30 inches; and the whole length, from the point of the beam to the end of the handles, between eight and nine feet. The sock and mouldboard make one line gently curving; and consequently gather no earth. Instead of a wrest, the under edge of the mouldboard is in one plain with the sole of the head; which makes a wide furrow, without leaving any part unstirred. It is termed the *chain-plough*, because it is drawn by an iron chain fixed to the back part of the beam immediately before the coulter. This has two advantages: first, by means of a muzzle, it makes the plough go deep or shallow; and, next, it stresses the beam less than if fixed to the point, and therefore a slenderer beam is sufficient.

87
Chain-plough.
Plate V.
fig. 1.

This plough may well be considered as a capital improvement; not only by saving expence, but by making better work. It is proper for loams; for carse-clays; and, in general, for every sort of tender soil free of stones. It is even proper for opening up pasture ground, where the soil has been formerly well cultivated.

88
Of the Sock,
Plate IV.

A spiked sock is used in the Scots plough. The difference between it and the feathered sock will be best understood by comparing their figures. Fig. 14. is the common sock, and fig. 15. the feathered one.

From the construction of the feathered sock, it is obvious, that it must meet with greater resistance than the common sock. However, when the plough takes off the earth of the furrow broader than that part of the sock which goes upon the head, it is more easily drawn than the plough with the common sock; for the earth which the common sock leaves to be opened by the wrest, is more easily opened by the feather of the other sock. In lea, the feathered sock makes the

N^o 7.

plough go more easily, because the roots of the grafs, which go beyond the reach of the plough, are more easily cut by the feather than they can be torn asunder by the common sock. The feathered sock is also of great use in cutting and destroying root-weeds. The common sock, however, answers much better in strong land.

It is proper here to add, that in fitting the feathered sock to the head, the point of it should be turned a little from the land, or a little to the right hand.

If we look back 30 years, ploughs of different constructions did not enter even into a dream. The Scots plough was universally used, and no other was known. There was no less ignorance as to the number of cattle necessary for this plough. In the south of Scotland, six oxen and two horses were universal; and in the north, 10 oxen, sometimes 12. The first attempt to lessen the number of oxen was in Berwickshire. The low part of that county abounds with stone, clay, and marl, the most substantial of all manures, which had been long used by one or two gentlemen. About 25 years ago it acquired reputation, and spread rapidly. As two horses and two oxen were employed in every marl-cart; the farmer, in summer-fallowing, and in preparing land for marl, was confined to four oxen and two horses. And as that manure afforded plenty of succulent straw for oxen, the farmer was surprised to find that four oxen did better now than six formerly. Marling, however, a laborious work, proceeded slowly, till people were taught by a noted farmer in that country, what industry can perform by means of power properly applied. It was reckoned a mighty task to marl five or six acres in a year. That gentleman, by plenty of red clover for his working-cattle, accomplished the marling 50 acres in a summer, once 54. Having so much occasion for oxen, he tried with success two oxen and two horses in a plough; and that practice became general in Berwickshire.

Now here appears with lustre the advantage of the chain-plough. The great friction occasioned in the Scots plough by a long head, and by the angle it makes with the mouldboard, necessarily requires two oxen and two horses, whatever the soil be. The friction is so much less in the chain-plough, that two good horses are found sufficient in every soil that is proper for it. Besides, the reducing the draught to a couple of horses has another advantage, that of rendering a driver unnecessary. This saving on every plough, where two horses and two oxen were formerly used, will, by the strictest computation, be L. 15 Sterling yearly; and where four horses were used, no less than L. 20 Sterling. There is now scarce to be seen in the low country of Berwickshire a plough with more than two horses; which undoubtedly in time will become general. We know but of one further improvement, that of using two oxen instead of two horses. That draught has been employed with success in several places; and the saving is so great, that it must force its way every where. It may be confidently affirmed, no soil stirred in a proper season, can ever require more than two horses and two oxen in a plough, even supposing the stiffest clay. In all other soils, two good horses, or two good oxen abreast, may be relied on for every operation of the chain-plough.

A chain-plough of a smaller size than ordinary, drawn

Practice.

89

Ignorance
of farmers
in Scotland
but a few
years ago.

90

Advantages
of the chain-
plough particularly
illustrated.

Fig. 1.

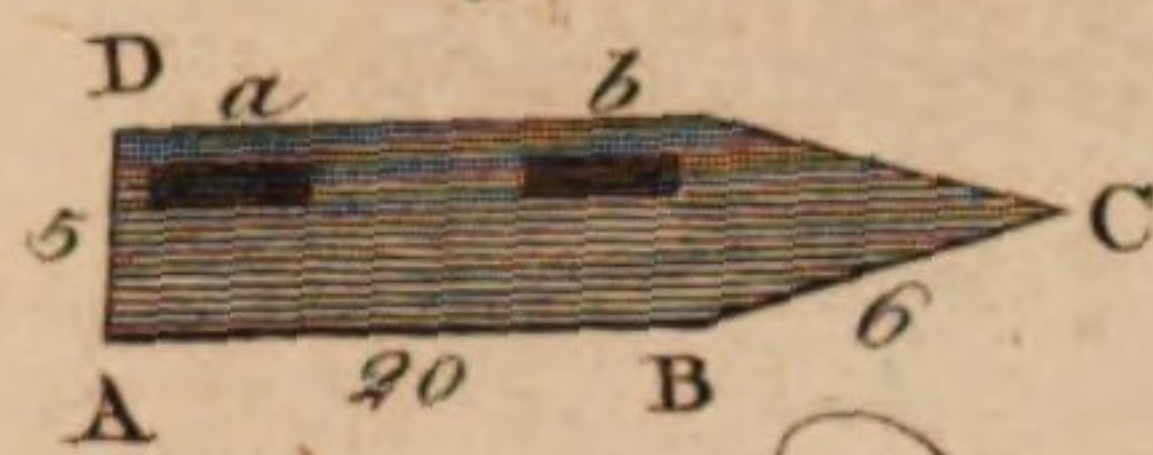


Fig. 2.

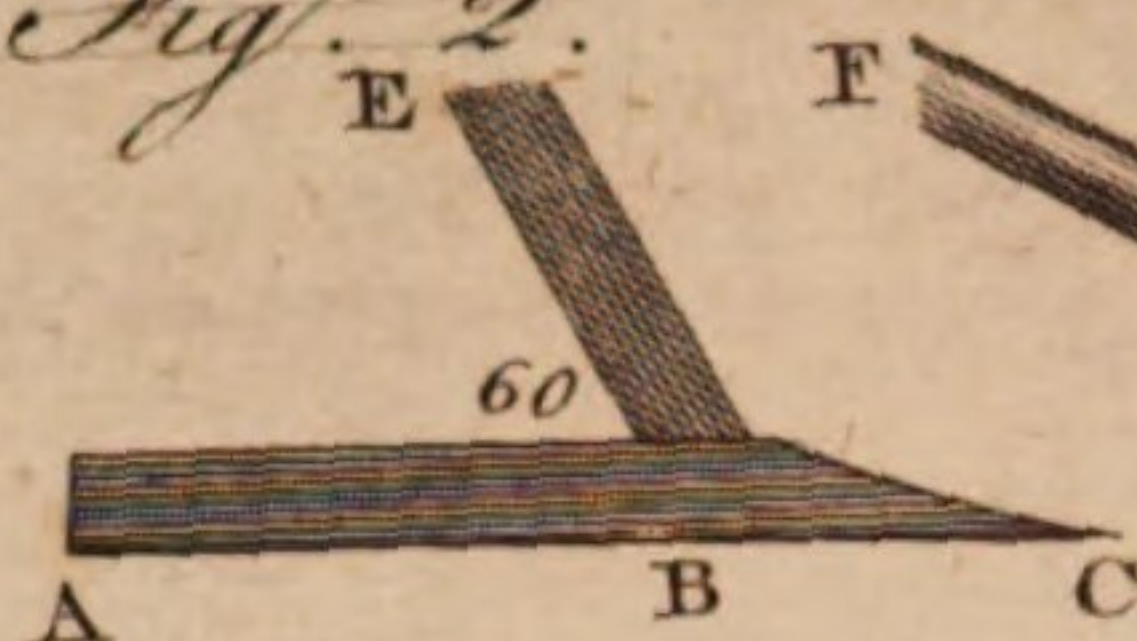


Fig. 5.



Fig. 3.

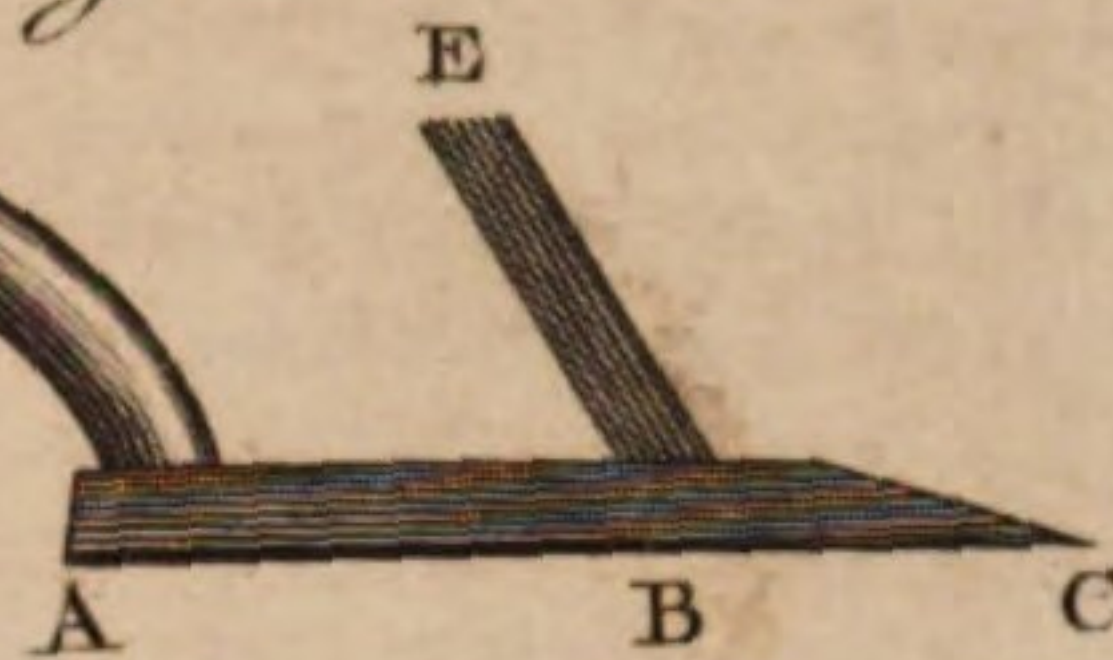


Fig. 4.



Fig. 6.

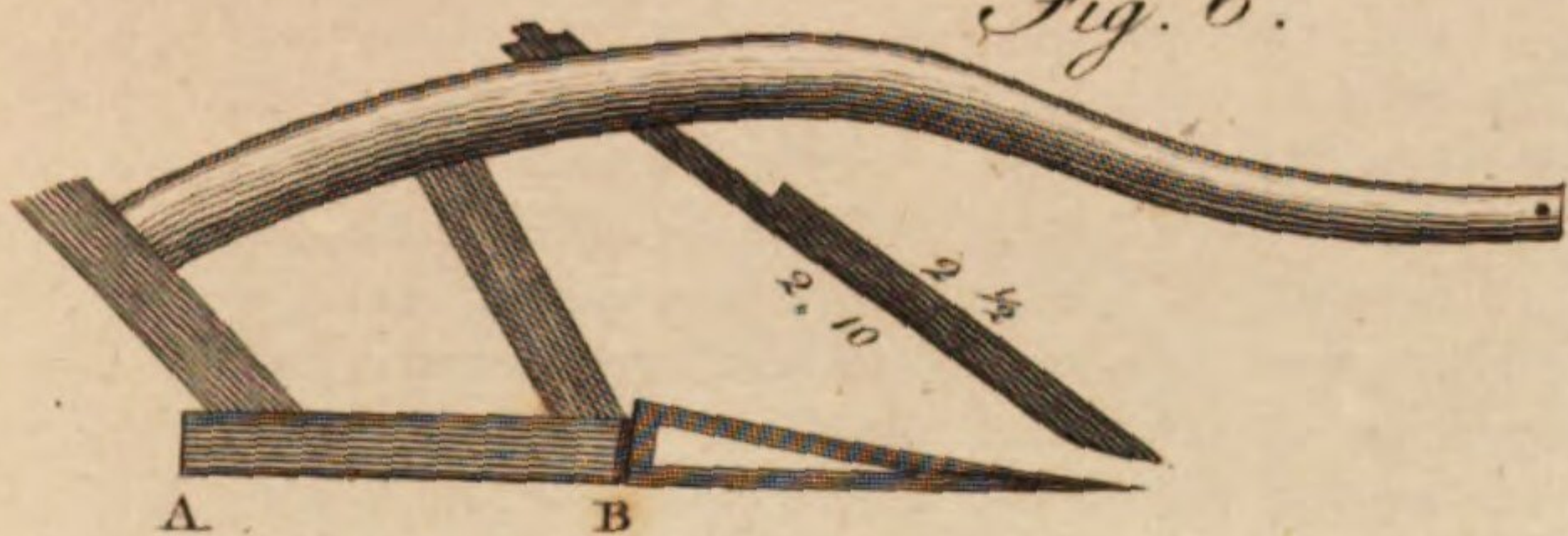


Fig. 7.

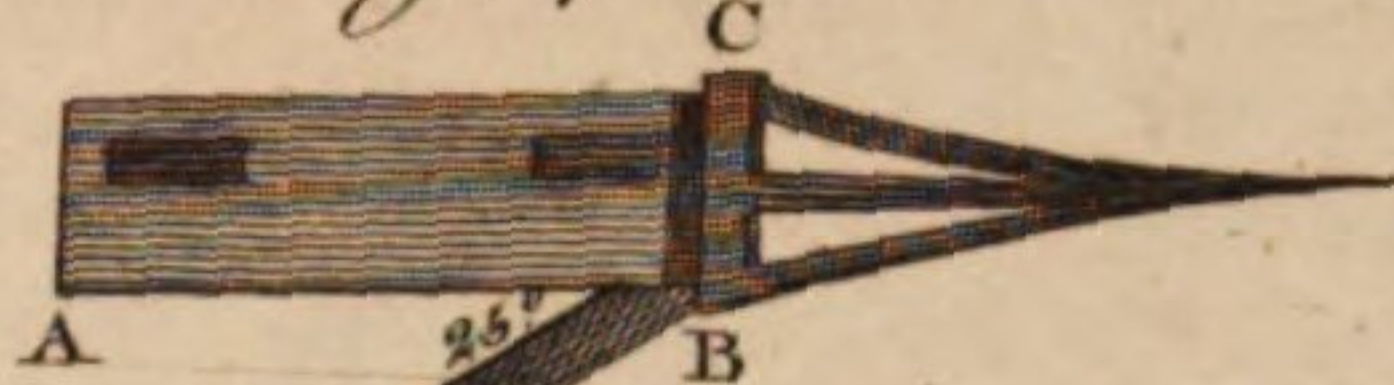


Fig. 8.

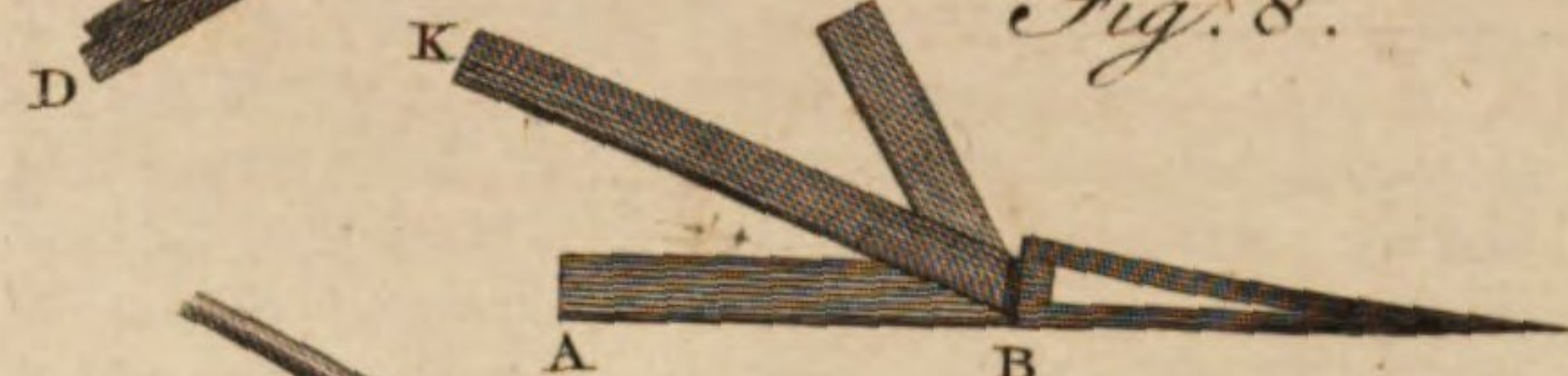


Fig. 9.

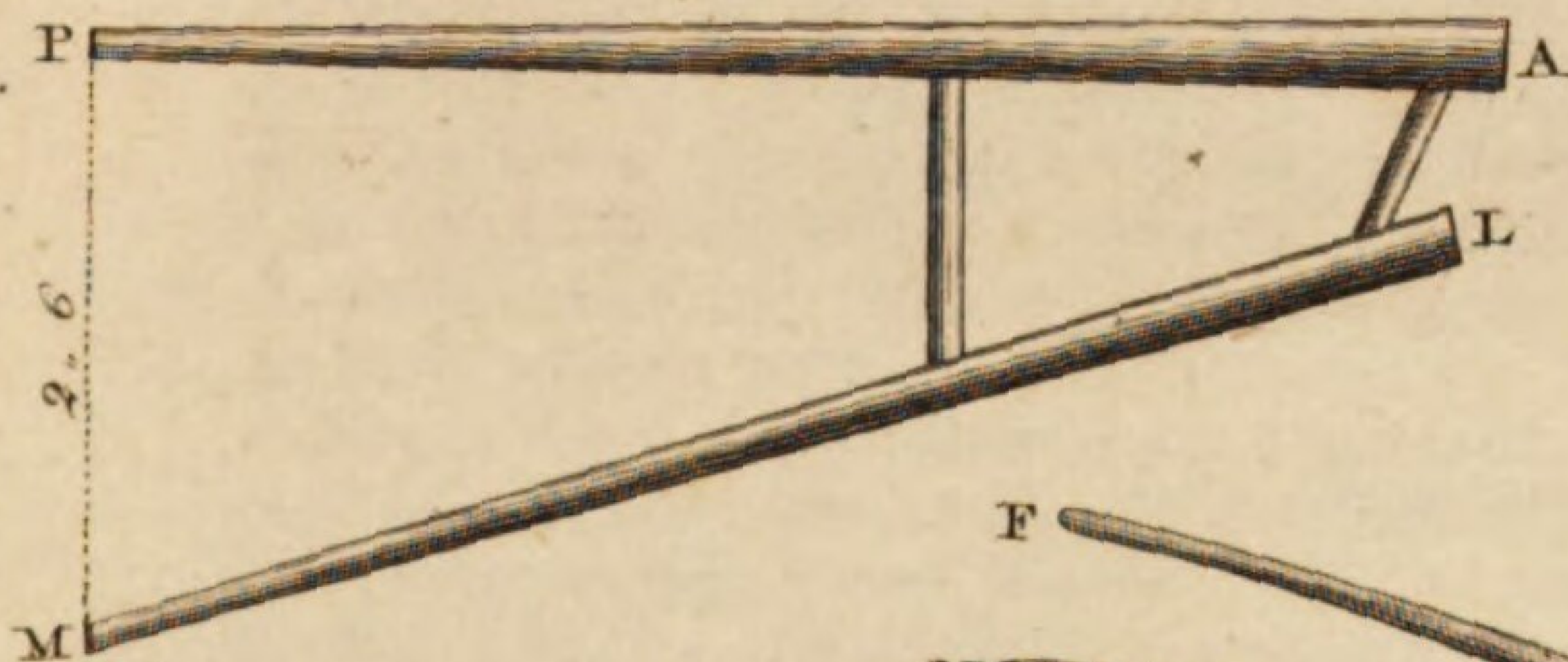


Fig. 13.

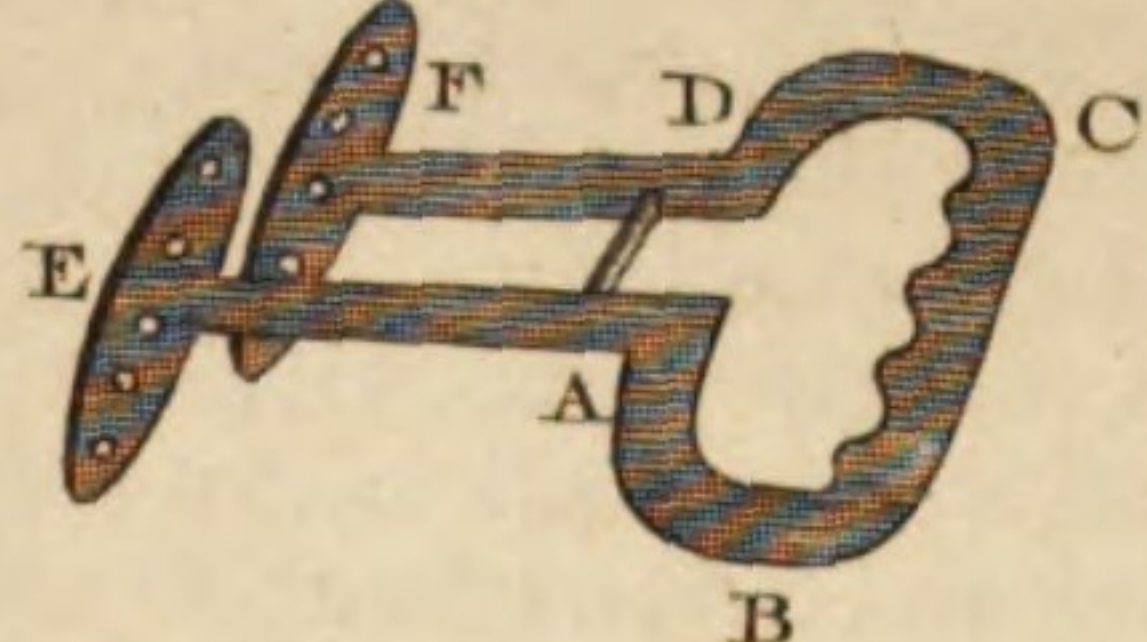


Fig. 10.

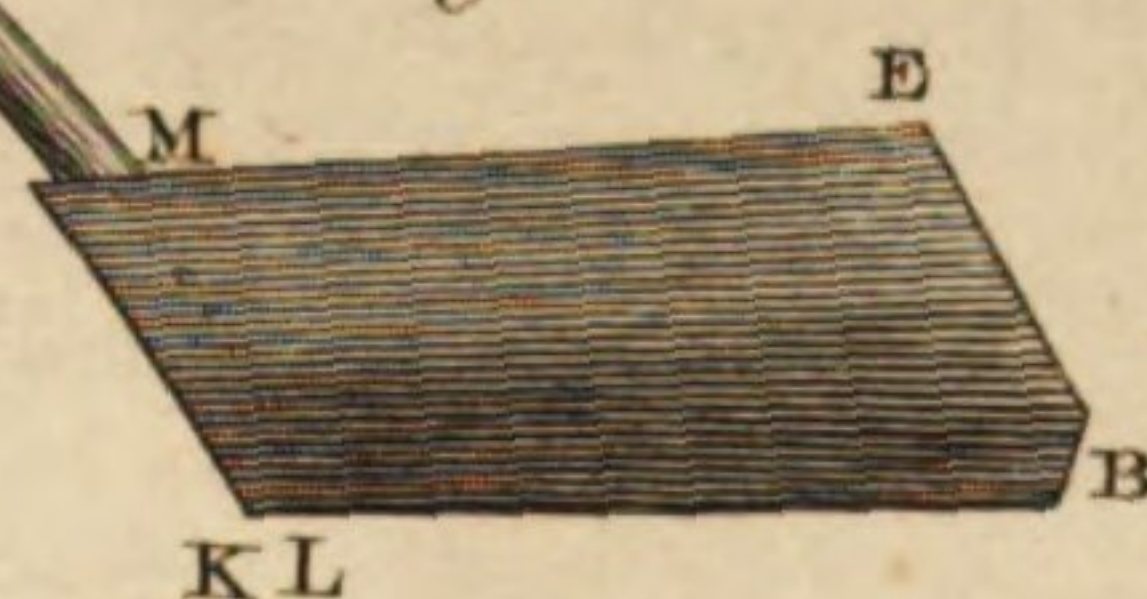


Fig. 11.

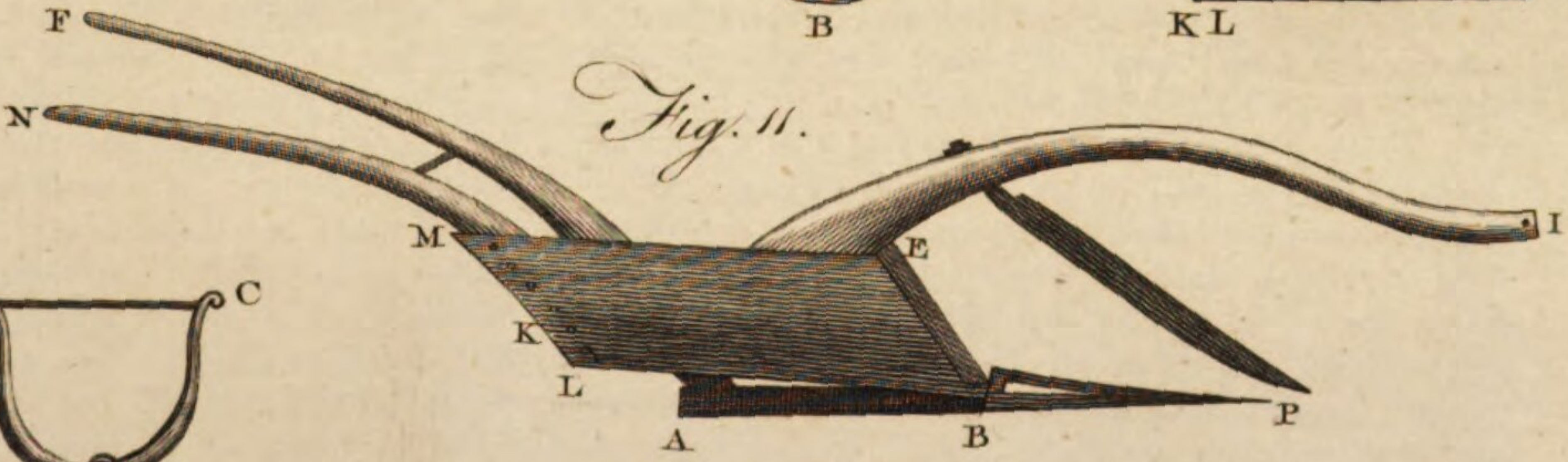


Fig. 12.

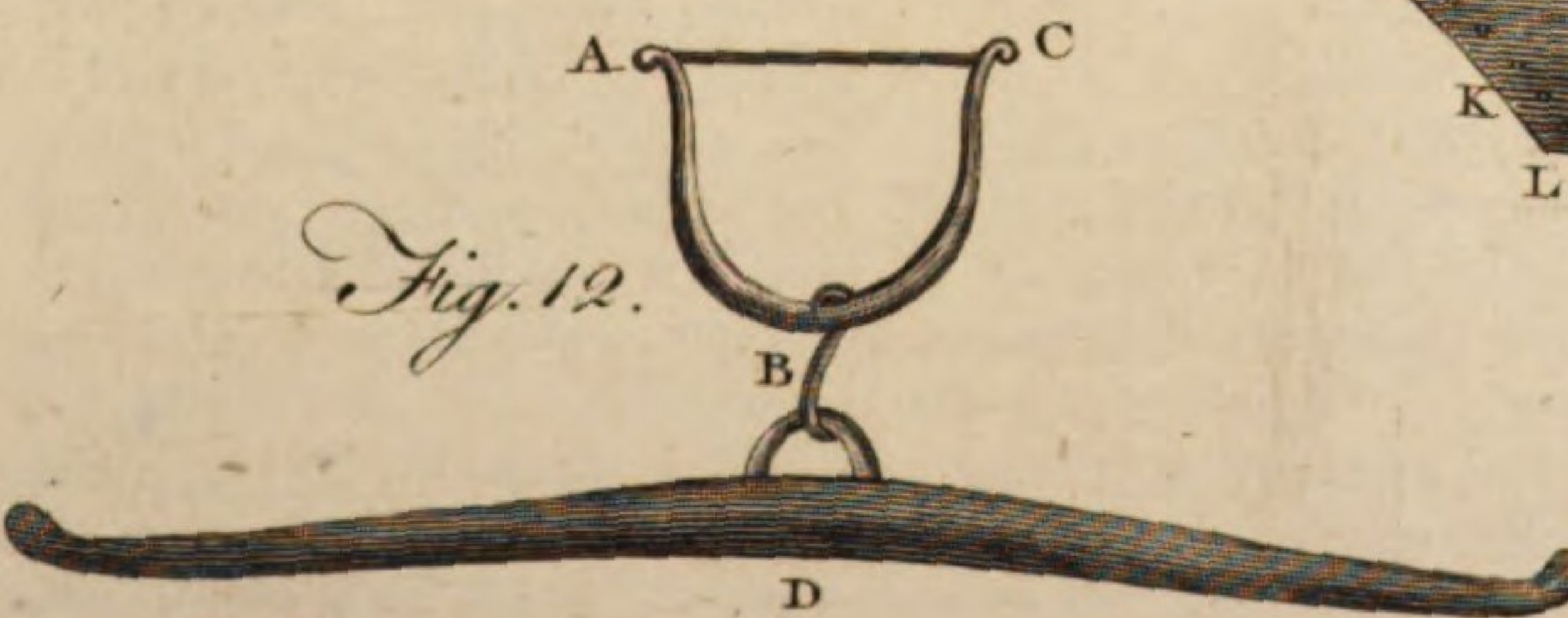


Fig. 15.

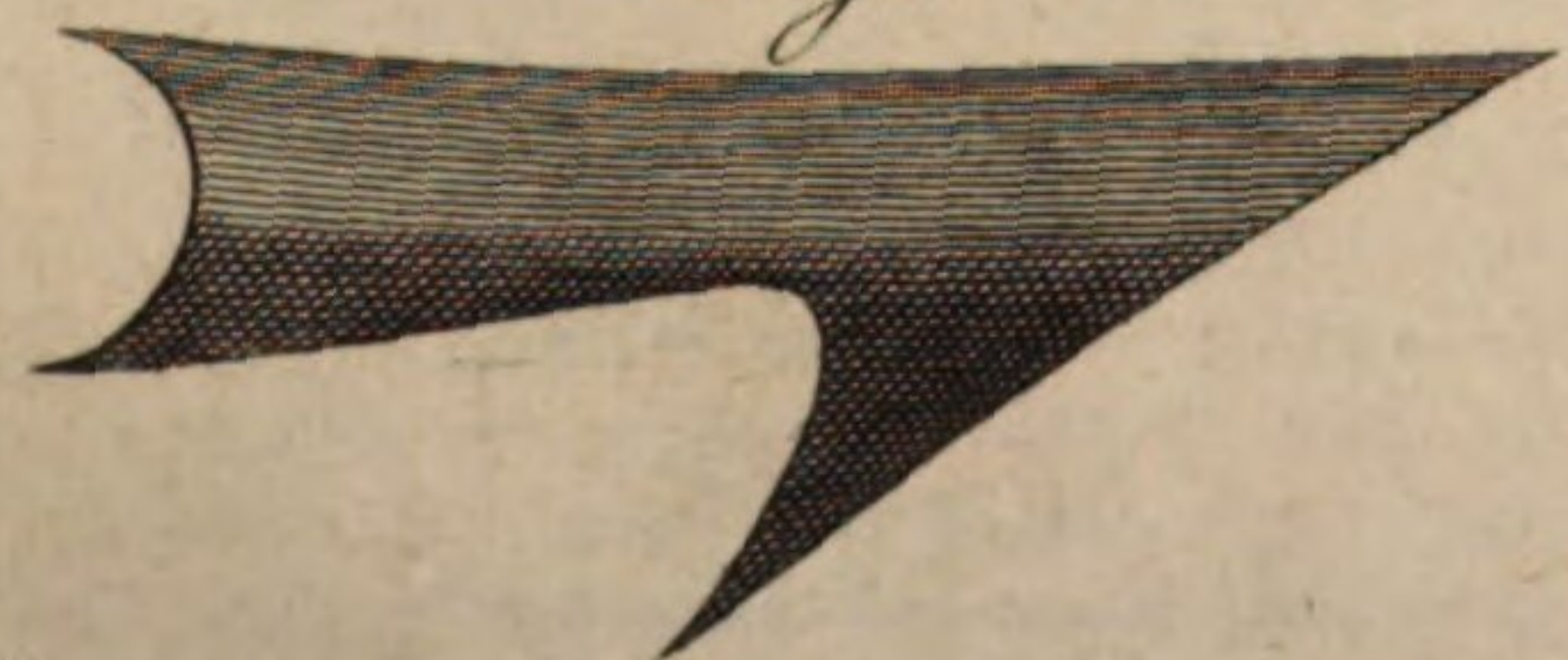


Fig. 16.



Fig. 14.



Practice. drawn by a single horse, is of all the most proper for horse-hoeing, supposing the land to be mellow, which it ought to be for that operation. It is sufficient for making furrows to receive the dung, for ploughing the drills after dunging, and for hoeing the crop.

⁹¹
A small
single-horse
plough re-
commend-
ed for va-
rious pur-
poses.

A still smaller plough of the same kind may be recommended for a kitchen-garden. It can be reduced to the smallest size, by being made of iron; and where the land is properly dressed for a kitchen-garden, an iron plough of the smallest size drawn by a horse will save much spade-work.—In Scotland, thirty years ago, a kitchen-garden was an article of luxury merely, because at that time there could be no cheaper food than oat-meal. At present, the farmer maintains his servants at double expence, as the price of oat-meal is doubled; and yet he has no notion of a kitchen-garden more than he had thirty years ago. He never thinks, that living partly on cabbage, kail, turnip, carrot, would save much oat-meal: nor does he ever think, that change of food is more wholesome, than vegetables alone, or oat-meal alone. We need not recommend potatoes, which in scanty crops of corn have proved a great blessing: without them, the labouring poor would frequently have been reduced to a starving condition. Would the farmer but cultivate his kitchen-garden with as much industry as he bestows on his potato crop, he needed never fear want; and he can cultivate it with the iron plough at a very small expence. It may be held by a boy of 12 or 13; and would be a proper education for a ploughman. But it is the landlord who ought to give a beginning to the improvement. A very small expence would inclose an acre for a kitchen-garden to each of his tenants; and it would excite their industry, to bestow an iron plough on those who do best.

Nor is this the only case where a single-horse plough may be profitably employed. It is sufficient for seed-furrowing barley, where the land is light and well-dressed. It may be used in the second or third ploughing of fallow, to encourage annual weeds, which are destroyed in subsequent ploughings.

⁹²
Rotheram
Plough,
Plate VI.
fig. 3.

The *Rotheram plough* is a machine of very simple construction, and easily worked. AB is the beam, CD the sheath, EBD the main handle, FR the smaller handle, GH the coulter, KI the sock or share, NP the bridle, S the fly-band, and ML a piece of wood in place of a head. The whole of this plough should be made of ash or elm; the irons should be steeled and well-tempered; and that part of the plough which is under ground in tilling should be covered with plates of iron. The difference between this and the common plough seems to consist in the bridle at the end of the beam, by which the ploughman can give the plough more or less land by notches at N, or make it cut deeper or shallower by the holes at P; in the coulter or share, which are so made and set as to cut off the new furrow without tearing; and in the mould-board, which is so shaped at first to raise a little, and then gradually turn over the new cut furrow with very little resistance. But the greatest advantage attending it, is its being so easy of draught, that it will do double the work of any common plough.

The *Paring-plough* is an instrument used in several parts of England for paring off the surface of the ground, in

Vol. I. Part I.

order to its being burnt. Mr Bradley has given the following description of a very simple instrument of this kind: From A to A (fig. 15.) is the plough-beam, about seven feet long, mortised and pinioned into the block B, which is of clean timber without knots. CC are the sheaths or standards, made flat on the inside, to close equally with the paring plate, and fastened to it with a bolt and key on each side, as at D. E is the paring plate of iron laid with steel, about four inches wide, and from 12 to 18 inches long. This plate must be made to cut on the sides, which are bolted to the standards as well as at the bottom part. FF are two iron braces to keep the standards from giving way: these standards must be mortised near their out-sides and through the block. GG are the plough handles, which must be fixed slope-ways between the beam and the standards. The pin-holes in the beam, the use of which is to make this plough cut more or less deep, by fixing the wheels nearer to or farther from the paring plate, should not be above two inches asunder.

Practice.
⁹³
The Paring
Plough,
Plate VI.
fig. 4.

Fig. 1. represents the four-coultered plough of Mr Tull. Its beam is ten feet four inches long, where- as that of the common plough is but eight. The beam is straight in the common plough, but in this it is straight only from *a* to *b*, and thence arched: so that the line let down perpendicularly from the corner at *a*, to the even surface on which the plough stands, would be 11½ inches; and if another line were let down from the turning of the beam at *b* to the same surface, it would be one foot eight inches and a half; and a third line let down to the surface from the bottom of the beam at that part which bears upon the pillow, will show the beam to be two feet ten inches high in that part. At the distance of three feet two inches from the end of the beam *a*, at the plough-tail, the first coulter, or that next the share, is let through; and at 13 inches from this, a second coulter is let through: a third at the same distance from that; and, finally, the fourth at the same distance from the third, that is, 13 inches, and from *a* to *b* is seven feet.

⁹⁴
The Four-
coultered
Plough,
Plate VI.

The crookedness of the upper part of the beam of this plough is contrived to avoid the too great length of the three foremost coulters, which would be too much if the beam was straight all the way; and they would be apt to bend and be displaced, unless they were very heavy and clumsy. Ash is the best wood to make the beam of, it being sufficiently strong, and yet light. The sheat in this plough is to be seven inches broad. The fixing of the share in this, as well as in the common plough, is the nicest part, and requires the utmost art of the maker; for the well-going of the plough wholly depends upon the placing this. Supposing the axis of the beam, and the left side of the share, to be both horizontal, they must never be set parallel to each other; for if they are, the tail of the share bearing against the trench as much as the point, would cause the point to incline to the right hand, and it would be carried out of the ground into the furrow. If the point of the share should be set so, that its side should make an angle on the right side of the axis of the beam, this inconvenience would be much greater; and if its point should incline much to the left, and make too large an angle on that side with the axis of the beam, the plough would run quite to the left hand;

Mm

and

Practice.

and if the holder, to prevent its running quite out of the ground, turns the upper part of his plough towards the left hand, the pin of the share will rise up, and cut the furrow diagonally, leaving it half unploughed. To avoid this and several other inconveniences, the straight side of the share must make an angle upon the left side of the beam; but that must be so very acute a one, that the tail of the share may only press less against the side of the trench than the point does. This angle is shown by the pricked lines at the bottom of fig. 9. where *ef* is supposed to be the axis of the beam let down to the surface, and *gf* parallel to the left side of the share: and it is the subtense *eg* that determines the inclination which the point of the share must have towards the left hand. This subtense, says Mr Tull, at the fore-end of an eight-feet beam, should never be more than one inch and a half, and whether the beam be long or short, the subtense must be the same.

The great thing to be taken care of, is the placing the four coulter; which must be so set, that the four imaginary places described by their four edges, as the plough moves forward, may be all parallel to each other, or very nearly so; for if any one of them should be very much inclined to, or should recede much from, either of the other, then they would not enter the ground together. In order to place them thus, the beam must be carefully pierced in a proper manner. The second coulters-hole must be two inches and a half more on the right hand than the first, the third must be as much more to the right of the second, and the fourth the same measure to the right hand of the third; and this two inches and a half must be carefully measured from the centre of one hole to the centre of the other. Each of these holes is a mortise of an inch and quarter wide, and three inches and a half long at the top, and three inches at the bottom. The two opposite sides of this hole are parallel to the top and bottom, but the back is oblique, and determines the obliquity of the standing of the coulters, which is wedged tight up to the poll. The coulters are two feet eight inches long before it is worn; the handle takes up sixteen inches of this length, and is allowed thus long, that the coulters may be driven down as the point wears away. As to the wheels, the left hand wheel is 20 inches diameter, and that on the right hand two feet three inches, and the distances at which they are set from each other is two feet $5\frac{1}{2}$ inches.

2. THE PATENT SWORD-CUTTER.

95
Patent
Sword-
cutter,
Plate VI.

THE different parts of this instrument are represented by N^o 1. 2. 3. of fig. 6. A. A. &c. a square frame 3 feet 4 inches from the fore to the hind part, by 4 feet 3 inches, the breadth of the machine within side; the timber (when of fir) 4 inches square, placed on two wheels B. B. 3 feet diameter, a little more or less (the old fore-wheels of a chaise may answer the purpose), to support the hind part of the machine.

C. C. &c. are six strong pieces of wood, called *bulls*, 3 feet long, 5 inches and a half broad, the thickness 6 inches at E, and tapering to 3 inches at F. Into these bulls are fixed the cutting wheels, which are iron, 13 inches diameter, $\frac{3}{4}$ ths of an inch thick at the centre, about an inch diameter for piercing holes to fix the iron axles in; from that they are to be of such

thickness, as allow the edges to be well steeled. The wheels are fixed by two bolts going through the bulls, with eyes on one end for the axles of the wheels to run in, and nuts and screws on the other to make them very firm by being sunk in the bulls, to prevent their interfering with the weights L. L. &c. resting on them.

G. G. &c. are hollow pieces of wood, called *thorles*, each $3\frac{1}{2}$ inches long, which inclose the bolt M. M. and keep the bulls C. C. &c. at their proper distances, but may be made longer or shorter at pleasure, according as the sward requires to be cut in larger or smaller pieces. They are in two pieces bound together, and jointed by a strap of leather or cord, which allows them to be readily changed when the cutting wheels require to be kept at more or less distance.

The iron bolt M. M. goes through two pieces of wood or iron P. P. 7 inches long, clear of the wood, supported by iron stays fixed to the frame, and thro' all the bulls. It requires to be strong, as the draught of the horses terminate there.

H. H. N^o 2. and 3. a cylinder or segment of wood, 7 inches diameter, called a *rocking tree*, which goes across the frame, and moves on the pivots fixed into it, one at each end, supported by an iron bolt or piece of wood mortised into the frame, 8 inches high, as appears in N^o 2. and 3. to which 6 chains or ropes are fixed by hooks, at different distances, as you want your cuts, 9, 8, 7, or 6 inches from one another, and are joined to the end of each bull in which the cutting wheels run; so that when the rocking tree is turned about by the lever I. fixed in the middle of it, all the bulls, with their cutting wheels, are raised out of the ground at once, as in N^o 3. by which means the machine may be turned, or moved from place to place with great ease, without any danger of straining the wheels.

L. L. L. &c. N^o 1. 2. 3. are weights of freestone, 26 inches long and 6 inches broad; the under one 4 inches thick, the upper one 3 inches thick; weighing about 64 lb. the under, and 48 the upper; each of them having two holes, through which iron spikes, firmly fixed in the bulls, pass, in order to keep them steady.

When the ground is easily cut, the under stone may answer; when more difficult, the other stone may be added; so that every wheel may have 7 stone-weight upon it, which has been found sufficient for the stiffest land and toughest sward the machine has ever been tried on. Cast iron weights will answer fully better, but are more expensive.

The lever I. N^o 2. 3. which ought to be 5 feet long, must have a sliding rope on it; fixed to the back part of the frame; so that when the cutting wheels are all taken out of the ground three or four inches, by the rocking tree's being turned partly round by the lever, the rope may be fixed to it by a loop over the pin R. N^o 3. (it ought to be placed 3 feet 4 inches from the extremity of the lever I.) Thus all the cutting wheels are kept out of the ground till the machine is turned; and then by moving the loop off the pin, it slips back towards the frame, and the lever is gently let back to its place, as in N^o 2. by which the cutting wheels are put into their former posture, by the weights fixed on the bulls in which they run. The levers may be made of good tough ash.

P. P. N^o 1.

Practice.

P. P. N^o 1. a small boat of iron, with a hook on one end of it (one is sufficient), to strengthen the bolt M. M. to be hooked on the centre of it, and joined to the frame by a nut and screw.

The grooves in which the cutting wheels run, may be covered below at the hinder part with a plate of thin black iron, 6 inches long, 3 inches broad, having a slit in it where the wheels run, to prevent (if found necessary) any grass, weeds, or small stones, from filling the grooves, and clogging the wheels.

To the frame N^o 1. are fixed (for a double-horse sward-cutter) three shafts, as in a waggon, of such length, strength, and distance from one another, as any workman may think proper.

For a single-horse sward-cutter (which has only four cutting wheels), a pair of shafts are used, and may make the two sides of the frame without any joinings. The width of the frame, in proportion to the double-horse sward-cutter, is as four to six.

It is recommended for a double-horse sward-cutter to have eight bulls and wheels, in order that when it is used to reduce hard clody summer-fallow, or land for barley, before the last furrow, or even after it, the whole weight (42 stone) employed in cutting the stiffest land and toughest sward, may be applied to the 8 bulls then at 6 inches from one another. The 64 lb. weights to be applied to six of the bulls, and two of the 48 lb. weights to each of the additional bulls, which is a sufficient weight for the purpose, and will effectually prevent a clod of more than six inches breadth from escaping being broke into pieces.

In the same manner, a single-horse sward-cutter may have six bulls for the above-mentioned purpose; the 28 stone belonging to it divided thus: The 64 lb. weights to four of the bulls, and two of the 48 lb. weights to each of the additional bulls.

That the machine may come as cheap as possible to the public, the inventor is of opinion, that the expence of the two wheels and the iron axle (which is considerable) may be saved, by joining strongly to the frame at S. N^o 3. a piece of wood with a little curve at the extremity of it, resembling the foot of a sledge, formerly much used in Scotland to carry in the corn from the field; the part of it resting on the ground being kept 18 inches (the half diameter of the wheels) from the frame by a strong support of wood.

As the two outer bulls next the frame are apt to get under it, so as to prevent the cutting wheels from being taken out of the ground, a thin slip of iron fixed to the inside of the frame, nearly opposite to the back end of the bulls, of convenient length, will be found necessary.

The original intention of this machine was to prepare old grass-ground for the plough, by cutting it across the ridges, in the beginning of or during winter, when the ground is soft, in order to answer all the purposes that Mr Tull proposed by his four-coulter plough above described, and so strongly recommended by him for bringing into tilth grass ground that has been long rested. This the sward-cutter has been found to do much more effectually and expeditiously: For Mr Tull's machine cuts the sward in the same direction with the plough; and is liable, from every obstruction any of the coulters meet with, to be thrown out of its work altogether, or the instrument broken:

Practice.

to which the sward-cutter, consisting of four, six, or more cutting wheels, is never liable, from these being entirely independent of one another, cutting the ground across the ridges before ploughing, and rendering that operation easier to two horses than it would be to three, without its being cut. The furrow being cut across, falls finely from the plough in squares of any size required not under six inches, in place of long slips of tough sward seldom and imperfectly broke by the four-coultered plough.

This instrument is very fit for preparing ground for burnbating, as it will save much hand-labour.

It may be properly used in cross-cutting clover of one or two years standing, to prepare the ground for wheat, if the land is stiff and moist enough.

It may be applied to cutting and cross-cutting pasture-ground, intended to have manure of any kind put upon it to meliorate the grass. In this it will far exceed the scarificator mentioned in one of Mr Young's tours; as that instrument is liable, as well as the four-coultered plough, to be thrown out of its work when meeting with a stone or other interruption. This the sward-cutter is proof against, which is looked on as its greatest excellence.

In preparing for barley, the sward-cutter excels a roller of any kind in reducing the large hard clods in clay land, occasioned by a sudden drought, after its being ploughed too wet; and it is likewise very proper for reducing such clay land when under a summer-fallow. In this operation, the sward-cutter is greatly to be preferred to the cutting-roller, likewise mentioned by Mr Young in one of his tours; for the wheels of the latter being all dependent one on another, when one is thrown out by a stone, three or four must share the same fate. Besides, the cutting-roller has but seven wheels in six feet; whereas the sward-cutter has six in four feet three inches, at nine inches distant; and, if necessary, may have them so near as six inches.

After old grass-ground is cut across with the sward-cutter and ploughed, it has a very uncommon and worklike appearance, from each square turned over by the plough being raised up an inch or two at the side last moved by the earth-board; so that the field when finished, is all prettily waved, and resembles a piece of water when blown on by a gentle breeze. By this means a very great deal of the land's surface is exposed to the frost and other influences of the air, which cannot fail to have a good effect on it.

Two horses are sufficient for the draught of a double-horse sward-cutter, and one horse for a single-horse one. One man manages the machine and drives the horses. He begins his operation by first measuring off 20 or 30 paces from the machine, less or more as he inclines, and there fixes a pole. He then cuts the field cross, as near at right angles with the ridges as he can. When the cutting wheels are past the last furrow about a yard or so, and the machine is upon the outmost ridge of the field on which it must turn, he must stop the horses; then take hold of the lever I. N^o 2. and by pulling it to him he raises the cutting wheels out of the ground, which are kept so by the loop of the rope being put over the pin R. in the lever I. N^o 3. till the machine is turned and brought to its proper place, which is done by measuring off the same distance for-

M m 2

merly

Practice

merely done on the opposite side of the field. When the cutting wheels are exactly over the outmost furrow, then, on the horses being stopped, the rope is slipt off the pin R. and the lever returned to its former place, as represented N^o 2. which allows the weights L. L. &c. to force the cutting wheels into the ground again. He then goes on till the interval betwixt the first and second stroke of the machine is all cut. In this manner the field is to be finished, after which you may begin to plough when you please. (N. B. There must be a pole at each side of the field.)

It is of no consequence whether the land to be sward-cut is in crooked ridges or straight, in flat ridges or in very high raised ones. Be the surface ever so uneven, the cutting wheels, being all independent of one another, are forced by their weights into every furrow or hollow.

One sward-cutter will cut as much in one day as six ploughs will plough.

The land may lie several months in winter after being sward-cut, when there is no vegetation to make the cuts grow together again before it is ploughed; but the sooner it is ploughed after cutting the better, that it may have the benefit of all the winter's frost, which makes it harrow better at seed-time.

When the ground is harrowed, the harrows ought to go with the waves which appear after ploughing, not against them, as by that means they are less apt to tear up the furrows all cut into squares. This, however, need only be attended to the two first times of harrowing, as they are called.

Any common wright and smith may make the instrument. It is very strong, very simple, and easily managed and moved from place to place; and, if put under cover, will last many years.

It was invented some time ago by the Honourable Robert Sandilands; and is represented in the Plate as it has been lately improved by him, the price being at the same time reduced from L. 15 or L. 16 to L. 5 or L. 6.

3. The BRAKE.

96
Brake described,
Plate V.
fig. 2.

THE brake is a large and weighty harrow, the purpose of which is to reduce a stubborn soil, where an ordinary harrow makes little impression. It consists of four square bulls, each side five inches, and six feet and a half in length. The teeth are 17 inches long, bending forward like a coulter. Four of them are inserted into each bull, fixed above with a screw-nut, having 12 inches free below, with a heel close to the under part of the bull, to prevent it from being pushed back by stones. The nut above makes it easy to be taken out for sharpening. This brake requires four horses or four oxen. One of a lesser size will not fully answer the purpose: one of a larger size will require six oxen; in which case the work may be performed at less expence with the plough.

97
Uses.

This instrument may be applied to great advantage in the following circumstances. In the following strong clay that requires frequent ploughings, a brakeing between every ploughing will pulverize the soil, and render the subsequent ploughings more easy. In the month of March or April, when strong ground is ploughed for barley, especially if bound with couch-

grafs, a cross-brakeing is preferable to a cross-ploughing, and is done at half the expence. When ground is ploughed from the state of nature, and after a competent time is cross-ploughed, the brake is applied with great success, immediately after the cross-ploughing, to reduce the whole to proper tilth.

Let it be observed, that a brake with a greater number of teeth than above-mentioned, is improper for ground that is bound together by the roots of plants, which is always the case of ground new broken up from its natural state. The brake is soon choked, and can do no execution till freed from the earth it holds. A less number of teeth would be deficient in pulverizing the soil.

4. The HARROW.

HARROWS are commonly considered as of no use but to cover the seed; but they have another use scarce less essential, which is to prepare land for the seed. This is an article of importance for producing a good crop. But how imperfectly either of these purposes is performed by the common harrow, will appear from the following account of it.

The harrow commonly used is of different forms. The first we shall mention has two bulls, four feet long and 18 inches asunder, with four wooden teeth in each. A second has three bulls and 12 wooden teeth. A third has four bulls, and 20 teeth of wood or iron, 10, 11, or 12 inches asunder. Now, in fine mould, the last may be sufficient for covering the seed; but none of them are sufficient to prepare for the seed any ground that requires subduing. The only tolerable form is that with iron teeth; and the bare description of its imperfections will show the necessity of a more perfect form. In the first place, this harrow is by far too light for ground new taken up from the state of nature, for clays hardened with spring-drought, or for other stubborn soils: it floats on the surface; and after frequent returns in the same tract, nothing is done effectually. In the next place, the teeth are too thick set, by which the harrow is apt to be choked, especially where the earth is bound with roots, which is commonly the case. At the same time, the lightness and number of teeth keep the harrow upon the surface, and prevent one of its capital purposes, that of dividing the soil. Nor will fewer teeth answer for covering the seed properly. In the third place, the teeth are too short for reducing a coarse soil to proper tilth; and yet it would be in vain to make them longer, because the harrow is too light for going deep into the ground. Further, the common harrows are so ill constructed, as to ride at every turn one upon another. Much time is lost in disengaging them. Lastly, it is equally unfit for extirpating weeds. The ground is frequently so bound with couch-grafs, as to make the furrow-lice stand upright, as when old lea is ploughed: notwithstanding much labour, the grafs-roots keep the field, and gain the victory.

A little reflection, even without experience, will make it evident, that the same harrows, whatever be the form, can never answer all the different purposes of harrowing, nor can operate equally in all different soils, rough or smooth, firm or loose. The following, therefore, have been recommended; which are of three different.

Practice

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Fig. 1. Chain Plough.



Fig. 2. Brake.

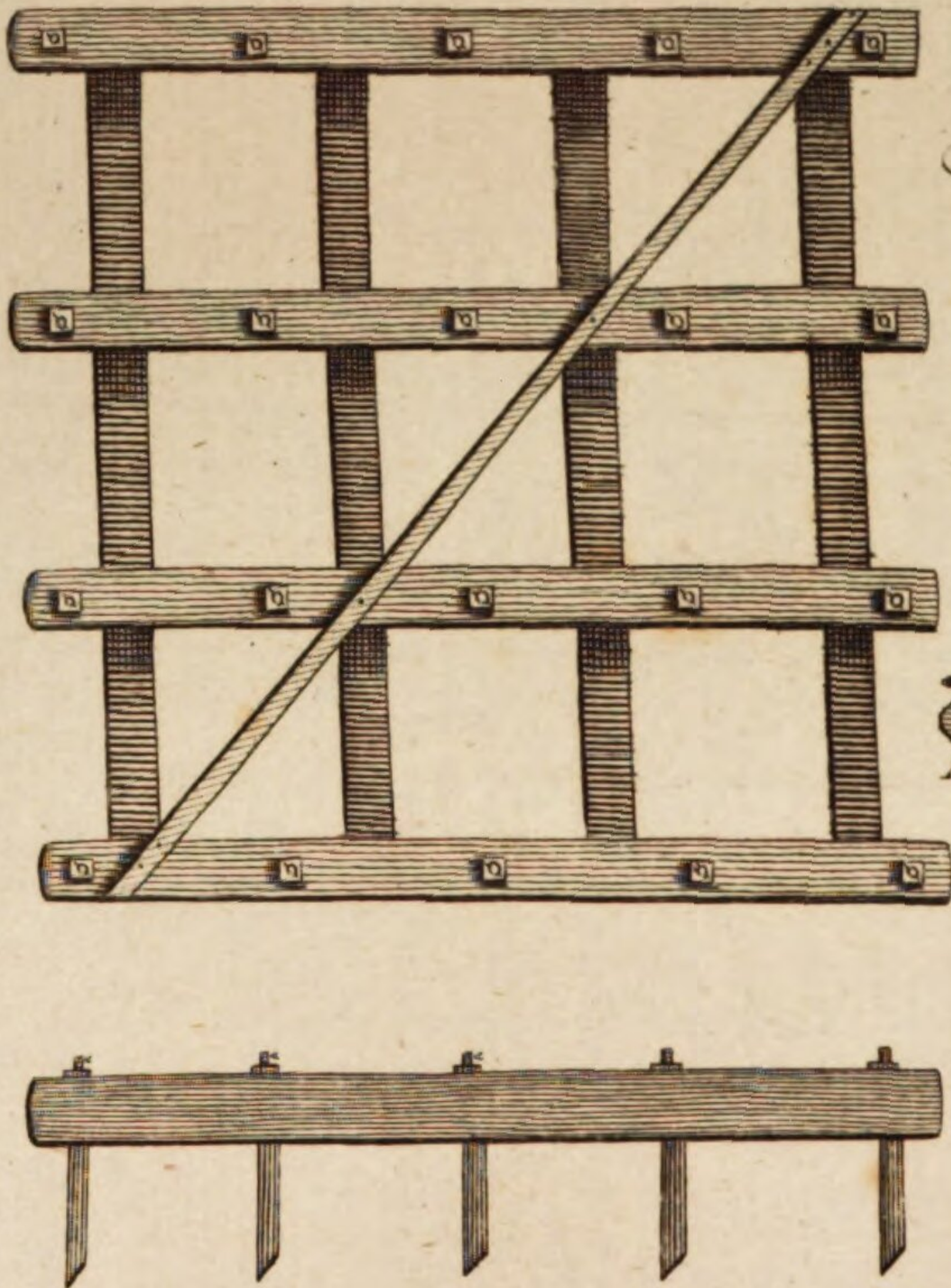


Fig. 3. first Harrow.

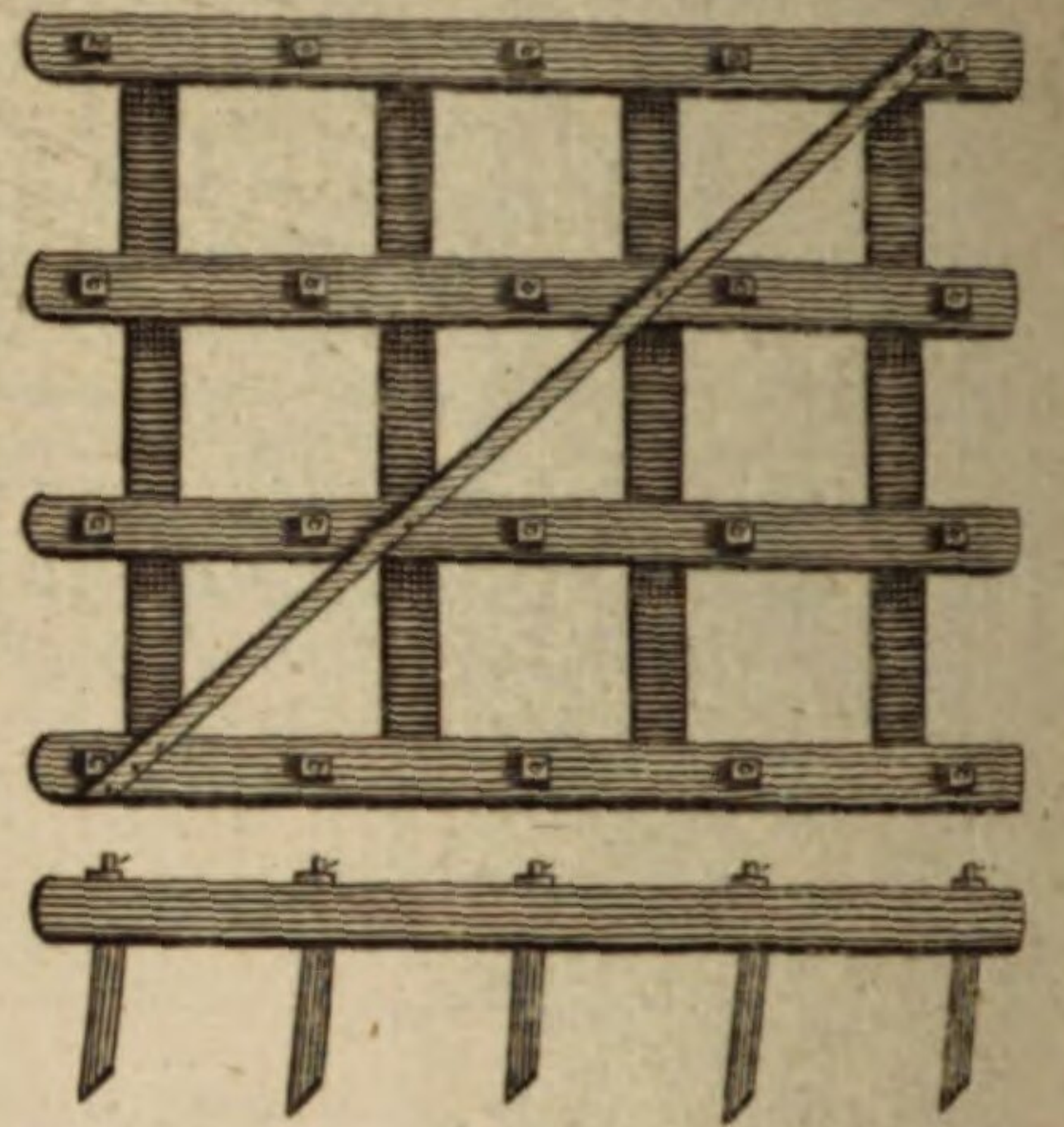


Fig. 8. Chain & Screw Harrow.

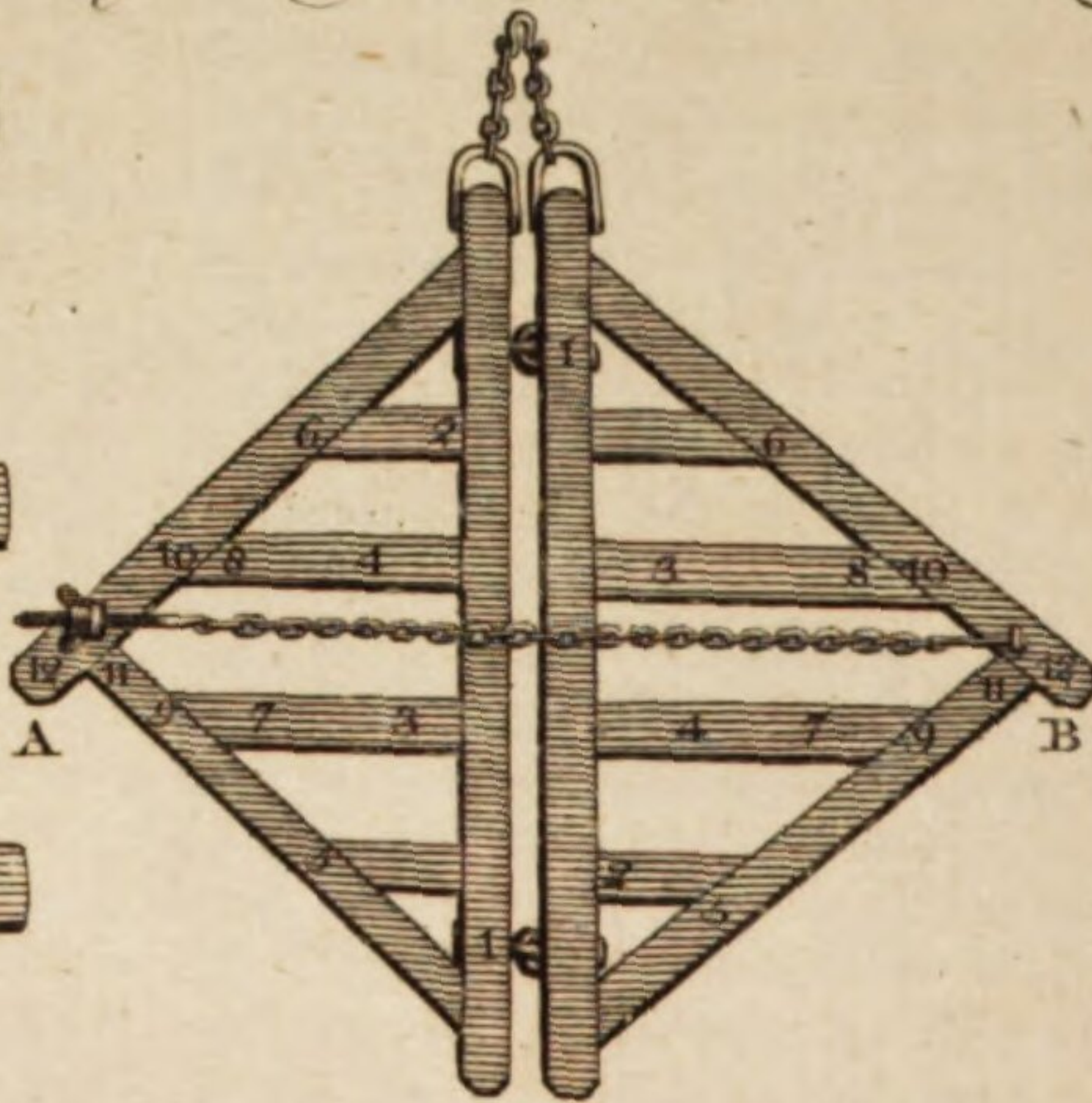


Fig. 4. second Harrow.

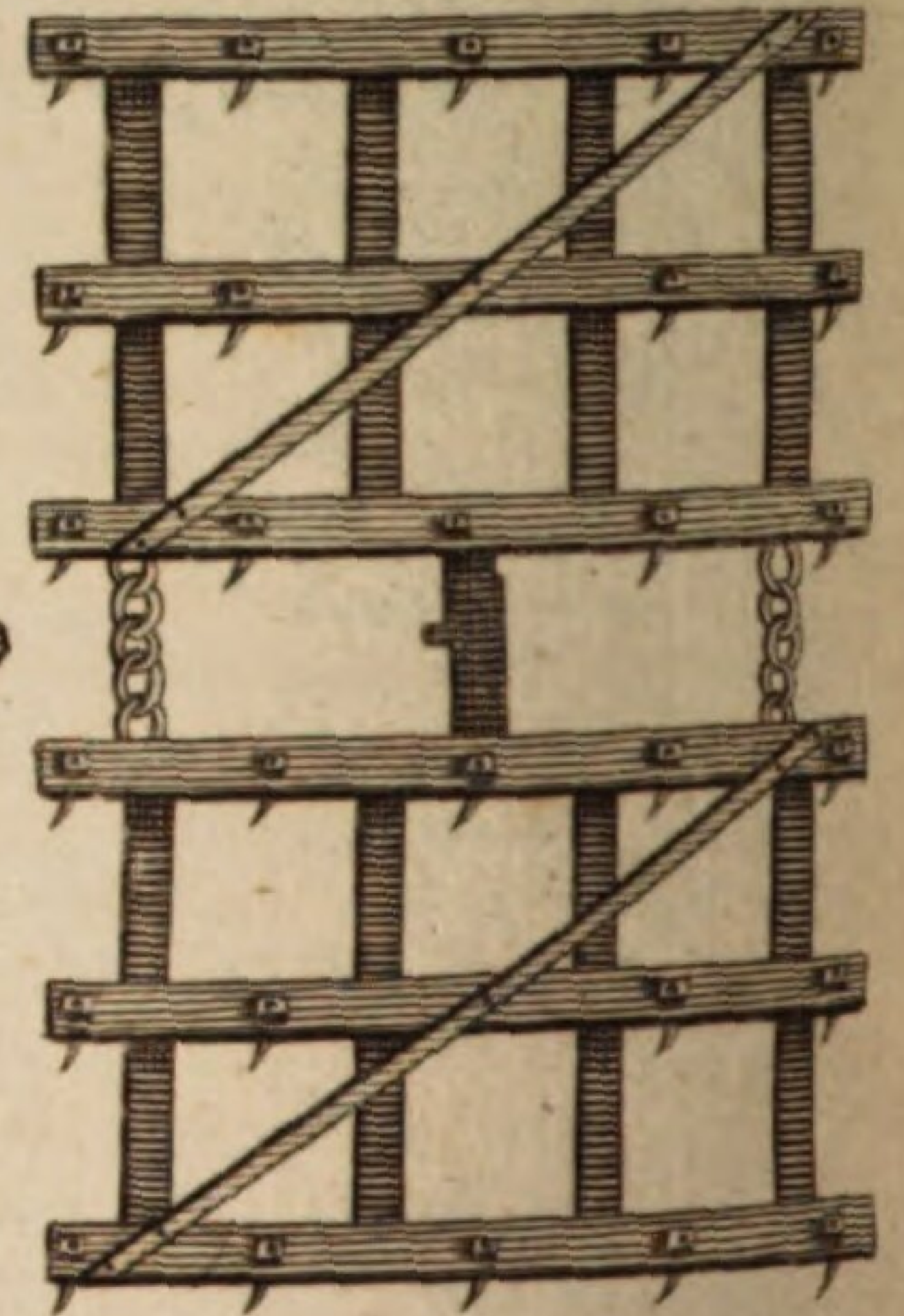


Fig. 5. third Harrow.

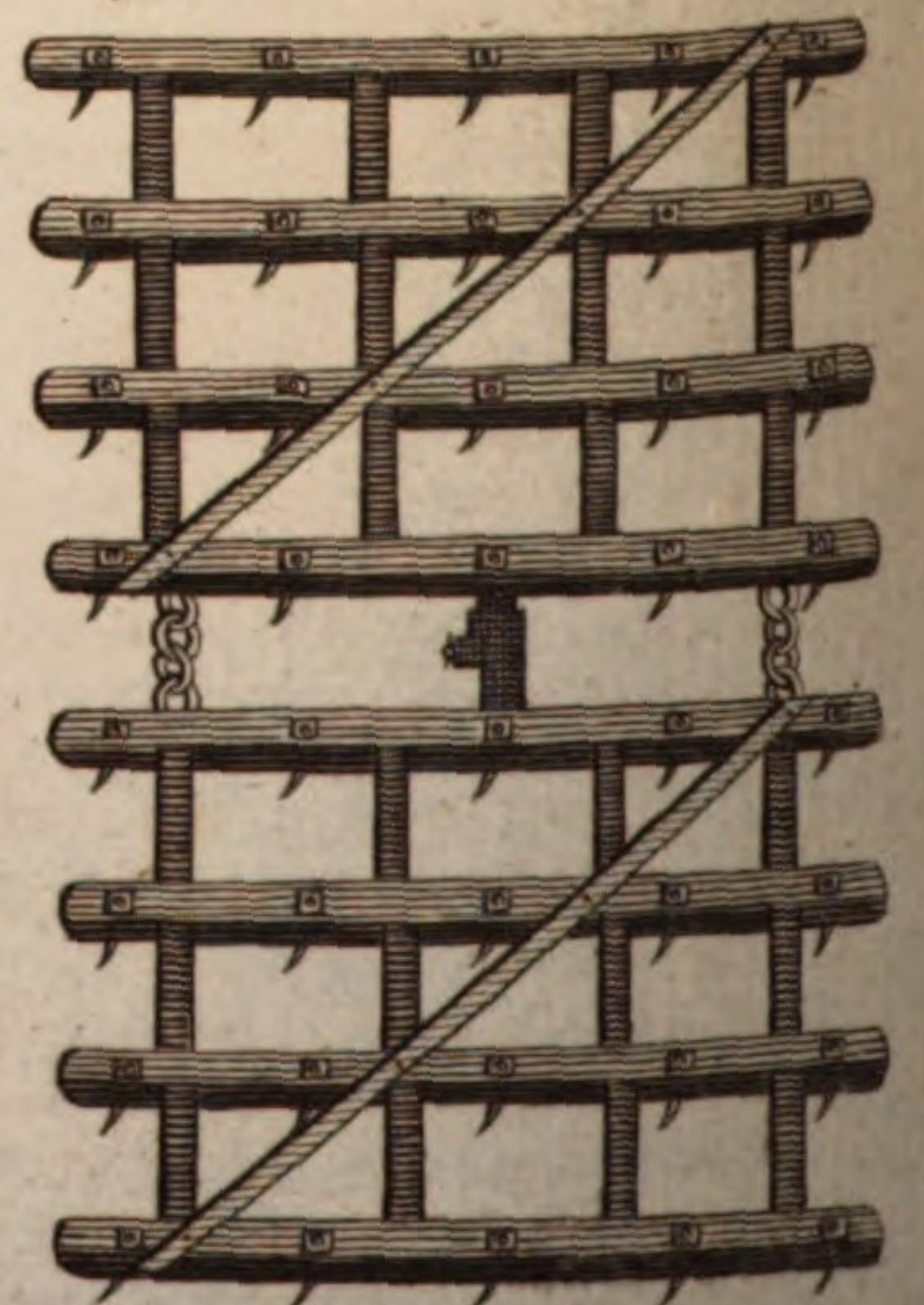
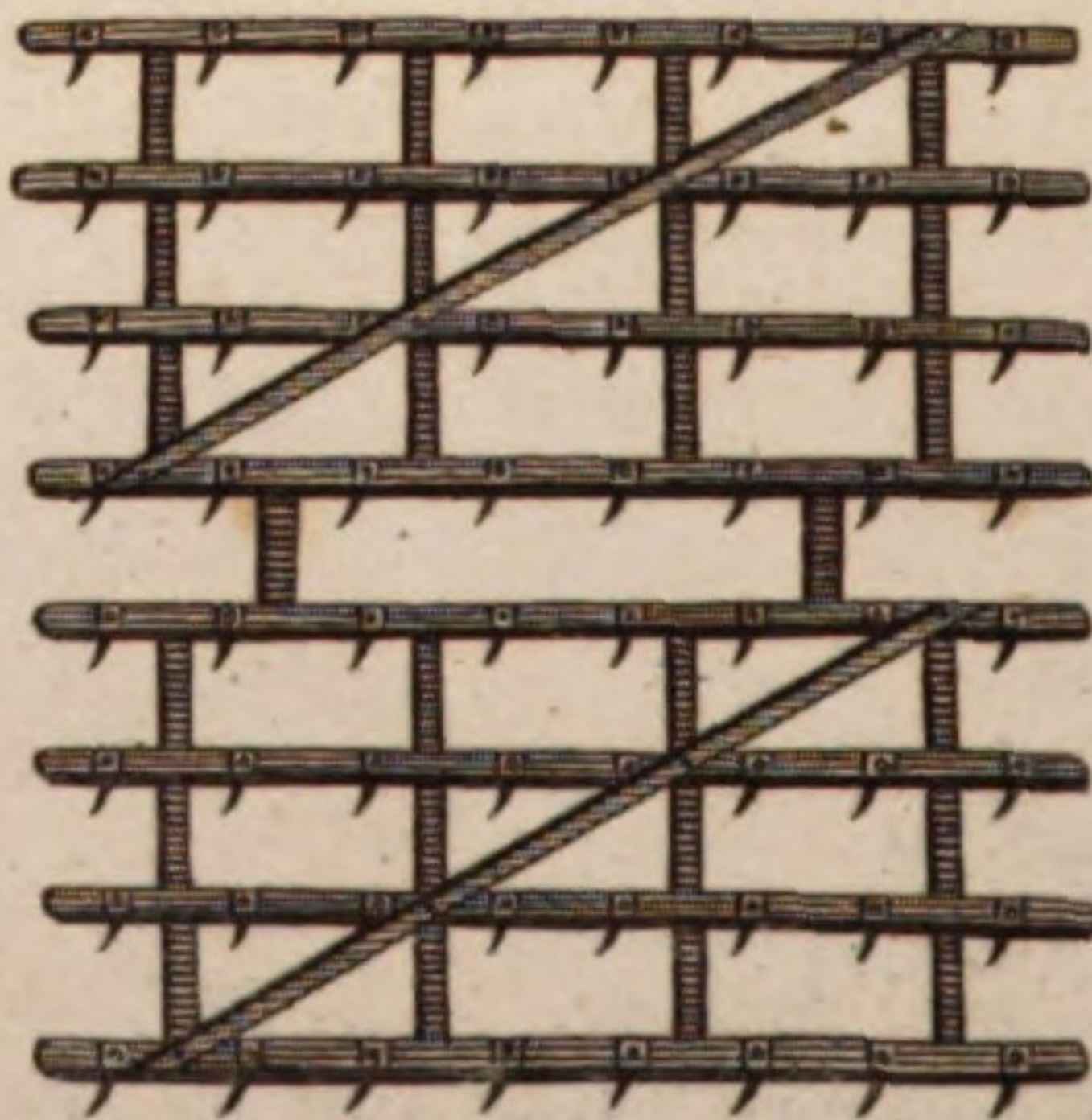


Fig. 6. Cleaning Harrow.



Fig. 7. Grass seed Harrow.



Part II.

A G R I C U L T U R E.

Practise. ferent forms, adapted for different purposes. They are all of the same weight, drawn each by two horses. Birch is the best wood for them, because it is cheap, and not apt to split. The first is composed of four bulls, each four feet ten inches long, three and a quarter inches broad, and three and a half deep; the interval between the bulls is one and three-fourths inches; so that the breadth of the whole harrow is four feet. The bulls are connected by four sheths, which go thro' each bull, and are fixed by timber-nails driven through both. In each bull five teeth are inserted, ten inches free under the bull, and ten inches asunder. They are of the same form with those of the brake, and inserted into the wood in the same manner. Each of these teeth is three pounds weight; and where the harrow is made of birch, the weight of the whole is six stone 14 pounds, Dutch. An erect bridle is fixed at a corner of the harrow, three inches high, with four notches for drawing higher or lower. To this bridle a double tree is fixed for two horses drawing abreast, as in a plough. And to strengthen the harrow, a flat rod of iron is nailed upon the harrow from corner to corner in the line of the draught.

Fig. 4. The second harrow consists of two parts, connected together by a crank or hinge in the middle, and two chains of equal length, one at each end, which keep the two parts always parallel, and at the same distance from each other. The crank is so contrived, as to allow the two parts to ply to the ground like two unconnected harrows; but neither of them to rise above the other, more than if they were a single harrow without a joint. In a word, they may form an angle downward, but not upward. Thus they have the effect of two harrows in curved ground, and of one weighty harrow in a plain. This harrow is composed of six bulls, each four feet long, three inches broad, and three and a half deep. The interval between the bulls nine and a half inches; which makes the breadth of the whole harrow, including the length of the crank, to be five feet five inches. Each bull has five teeth, nine inches free under the wood, and ten inches asunder. The weight of each tooth is two pounds; the rest as in the former.

Fig. 5. The third consists also of two parts, connected together like that last mentioned. It has eight bulls, each four feet long, two and a half inches broad, and three deep. The interval between the bulls is eight inches; and the breadth of the whole harrow, including the length of the crank, is six feet four inches. In each bull are inserted five teeth, seven inches free under the wood, and ten and a half inches asunder, each tooth weighing one pound. The rest as in the two former harrows.

100 Properties of these harrows. These harrows are a considerable improvement. They ply to curved ground like two unconnected harrows; and when drawn in one plain, they are in effect one harrow of double weight, which makes the teeth pierce deep into the ground. The imperfection of common harrows, mentioned above, will suggest the advantages of the set of harrows here recommended. The first is proper for harrowing land that has long lain after ploughing, as where oats are sown on a winter-furrow, and in general for harrowing stiff land: it pierces deep into the soil by its long teeth, and divides it minutely. The se-

cond is intended for covering the seed: its long teeth lays the seed deeper than the common harrow can do; which is no slight advantage. By placing the seed considerably under the surface, the young plants are, on the one hand, protected from too much heat, and, on the other, have sufficiency of moisture. At the same time, the seed is so well covered that none of it is lost. Seed slightly covered by the common harrows wants moisture, and is burnt up by the sun; beside, that a proportion of it is left upon the surface uncovered. The third harrow supplies what may be deficient in the second, by smoothing the surface, and covering the seed more accurately. The three harrows make the ground finer and finer, as heckles do lint; or, to use a different comparison, the first harrow makes the bed, the second lays the seed in it, the third smooths the cloaths. They have another advantage not inferior to any mentioned: they mix manure with the soil more intimately than can be done by common harrows; and upon such intimate mixture depends greatly the effect of manure, as has already been explained. To conclude, these harrows are contrived to answer an established principle in agriculture, That fertility depends greatly on pulverizing the soil, and on an intimate mixture of manure with it, whether dung, lime, marl, or any other.

The Chain and Screw Harrow. **Fig. 8.** is the plan of a harrow also invented by Mr Sandilands, and to which he has given the name of the *chain and screw harrow*. Its properties are, that if your ridges be high, and you wish to harrow them from one end to the other, by lengthening the chain (which the screw commands), the harrow, when drawn along, forms an angle, downwards, and misses none of the curve of the ridge, so far as it extends (which may be nine feet, the distance from A to B. The extent, in the contrary direction, is five feet six inches). When the crowns of the ridges have got what is thought sufficient harrowing lengthwise, you shorten the chain by the screw, which forms an angle upwards: the harrow is then drawn by the horses, one on each side of the furrow; which completely harrows it, and the sides of the ridge, if 18 feet broad.

When you want to harrow even ground or high ridges across with the screw, you can bring the harrow to be horizontal, so as to work as a solid harrow without a joint.

The teeth are formed and fixed in the common manner, square, not in the fashion of coulter; and are nine or ten inches below the wood, and of such strength as it is thought the land requires. The teeth cut, or rather tear, the ground at every four inches without variation, though seemingly placed irregularly; and this without any risk of choking, except sometimes at the extreme angles, where the teeth are necessarily near other; but which may be cleaned with the greatest ease, by raising them a little from the ground. The figures 1, 2, &c. point out where the 12 teeth on each side of the harrow are placed.

Where a strong brake-harrow is not necessary, by making the teeth shorter and lighter, you may have 48 teeth, which will tear the ground at every two inches, cover the seed well, and make a fine mould.

It is recommended, that harrows for every purpose, and

Practise.

Plate V.

Practice. and of any size, be made on the above principle; by which no tooth can ever follow the tract of another, and all of them will be kept constantly acting.

5. The ROLLER.

101
The roller.

THE roller is an instrument of capital use in husbandry, though scarcely known in ordinary practice; and, where introduced, it is commonly so slight as to have very little effect.

Rollers are of different kinds; stone, cast-iron, wood. Each of these has its advantages. We would recommend the last, constructed in the following manner. Take the body of a tree, six feet ten inches long, the larger the better, made as near a perfect cylinder as possible. Surround this cylinder with three rows of staves, one row in the middle, and one at each end. Line these staves with planks of wood equally long with the roller, and so narrow as to ply into a circle. Bind them fast together with iron rings. Beech-wood is the best, being hard and tough. The roller thus mounted, ought to have a diameter of three feet ten inches. It has a double pair of shafts for two horses abreast. These are sufficient in level ground; in ground not level, four horses may be necessary. The roller without the shafts ought to weigh 200 stone Dutch; and the large diameter makes this great weight easy to be drawn.

102
Season for rolling.

Rolling wheat in the month of April is an important article in loose soil; as the winter-rains pressing down the soil leave many roots in the air. Barley ought to be rolled immediately after the seed is sown; especially where grass-seeds are sown with it. The best time for rolling a gravelly soil, is as soon as the mould is so dry as to bear the roller without clinging to it. A clay soil ought neither to be tilled, harrowed, nor rolled, till the field be perfectly dry. And as rolling a clay soil is chiefly intended for smoothing the surface, a dry season may be patiently waited for, even till the crop be three inches high. There is the greater reason for this precaution, because much rain immediately after rolling is apt to cake the surface when drought follows. Oats in a light soil may be rolled immediately after the seed is sown, unless the ground be so wet as to cling to the roller. In a clay soil, delay rolling till the grain be above ground. The proper time for sowing grass-seeds in an oat-field, is when the grain is three inches high; and rolling should immediately succeed, whatever the soil be. Flax ought to be rolled immediately after sowing. This should never be neglected; for it makes the seed push equally, and prevents after-growth; the bad effect of which is visible in every step of the process for dressing flax. The first year's crop of sown grasses ought to be rolled as early the next spring as the ground will bear the horses. It fixes all the roots precisely as in the case of wheat. Rolling the second and third crops in loose soil is an useful work; though not so essential as rolling the first crop.

103
Effects of rolling.

In the first place, rolling renders a loose soil more compact and solid; which encourages the growth of plants, by making the earth clap close to every part of every root. Nor need we be afraid of rendering the soil too compact; for no roller that can be drawn by two or four horses will have that effect. In the next place,

rolling keeps in the moisture, and hinders drought to penetrate. This effect is of great moment. In a dry season, it may make the difference of a good crop, or no crop, especially where the soil is light. In the third place, the rolling grass seeds, beside the foregoing advantages, facilitates the mowing for hay; and it is to be hoped, that the advantage of this practice will lead farmers to mow their corn also, which will increase the quantity of straw both for food and for the dunghill.

There is a small roller for breaking clods in land intended for barley. The common way is, to break clods with a mell; which requires many hands, and is a laborious work. This roller performs the work more effectually, and at much less expence: let a harrowing precede, which will break the clods a little; and after lying a day, or a day and a half, to dry, this roller will dissolve them into powder. This however does not supersede the use of the great roller after all the other articles are finished, in order to make the soil compact, and to keep out the summer-drought. A stone roller four feet long, and fifteen inches diameter, drawn by one horse, is sufficient to break clods that are easily dissolved by pressure. The use of this roller in preparing land for barley is gaining ground daily, even among ordinary tenants, who have become sensible both of the expence and toil of using wooden mells. But in a clay soil, the clods are sometimes too firm, or too tough, to be subdued by so light a machine. In that case, a roller of the same size, but of a different construction, is necessary. It ought to be surrounded with circles of iron, six inches asunder, and seven inches deep; which will cut even the most stubborn clods, and reduce them to powder. Let not this instrument be considered as a finical refinement. In a stiff clay it may make the difference of a plentiful or scanty crop.

6. The FALLOW-CLEANSING MACHINE.

104
The fallow-cleansing machine, Plate VI. fig. 5.
THIS was invented by Mr Aaron Ogden, a smith at Ashton-under-Line, near Manchester in Lancashire. It is intended for cleansing fallows from weeds, &c. which exhaust the riches of the soil. A, A, is the frame; B, the first roller; C, the second ditto; in which last are two cranks to move the arms D, D, which work the rake up the directors fixed on the plank E. The under side of the lower ends or shares of these directors are sharp, to cut the clods and let them come on the upper side. Each alternate heel of the share is longer than the intermediate one, that they may not have more than one-half to cut at once. At the back of the plank E are two screws to let it loose, that the directors may be set higher or lower. The shares are to penetrate the ground two or three inches, to raise the quicks till the rake I, I, fetches them into the cart H, where a man must be ready with a muck-hook to clear them backward when gathered. In the rake I are two teeth for every space of the directors, that stones, &c. may be gathered without damage. K, K, are two staples, by which the machine is drawn: under them at h are two hooks, placed low to raise the machine in turning, by the help of the traces; and the axle-tree of the cart should be fixed upon a pin, that it may turn like a waggon. F, F, are the triggers to throw the rake behind the roots. The long teeth at G, G, are to cleanse the roller C. I, I, is the rake which gathers up the weeds into

Practice. into the cart H, and is drawn above the trigger F by the working of the arms D, expressed by the dotted lines at *dd, iii.* The triggers F, of which there is one on each side, move on the pivots *a*; so that when the points *b* of the rake I have been drawn up by the directors E to the part marked *c*, the trigger, giving way, permits the rake to pass; but immediately falling, the rake returns along the upper surface of the trigger marked *e, e*, and of course falls on the weeds when it comes to the end, a little beyond the pivot *a*. The reader will observe, that the boarding is taken away on one side, in the Plate, in order to give a more perfect view of the inner parts of the machine; and in fact it would perhaps be better if all the boarding, marked L, L, L, was taken away, and frame-work put in its stead. The cart H might undoubtedly also be made lighter. The wheels M, M, appear in the Plate to be made of solid wood; but there is no necessity they should be so. At N is another view of the roller C, by which the disposition of the spikes may be easily comprehended. Suppose the circle O, described by the end of the roller N, to be divided by four strait lines into eight equal segments, as represented at P. Let the same be done at the other end of the roller, and parallel lines be drawn from one corresponding point to the other the length of the roller; mark the points with figures 1, 2, 3, 4, 5, 6, 7, 8; afterwards draw oblique lines, as from 1, at the end of O, to 2, at the other end, and from 2 to 3, &c. on these oblique lines the spikes are to be fixed at equal distances, in eight circles, described on the circumference of the roller. The spikes of the small roller B are fixed in the same manner, except that the diameter being smaller, there are only six instead of eight rows. R is another view of the directors, with the plank E on which they are fixed; and S is a section of a part of the plank, with one of the directors as fixed, in which may be seen the heel *m*, from whence to the point of the share *n* is a sharp cutting edge. See the same letters in figure R. At T is one of the long teeth to be seen at G; it is bent towards the roller C, which it serves to cleanse. When the end of the rake *b*, after rising above *c*, is pushed, by the motion of the arms D, D, along the upper part *e, e*, of the trigger F, and comes to the end beyond *a*; as it falls, the part of the arm marked *o* rests in the notch *p*, till it is again raised by the motion of the roller C with the rake. The roller C is to be one foot diameter, the spikes nine inches long, that they may go through the furrow (if the soil should be loose) into the hard earth, the more effectually to work the rake, which otherwise might be so overcharged as to cause the roller to drag without turning. In the rake-ends *b* there should be pivots, with rollers or pullers on, to go in the groove, to take off the friction; and they would likewise take the triggers more surely as the rake comes back. The rake should also be hung so far backward, that when it is fallen the arms of it may lie in the same plane or parallel with the directors, on which it comes up (which will require the frame to be two inches longer in the model). This will cause the rake to fall heavier, and drive the teeth into the roots, and bring them up without shattering. These teeth must be made of steel, very fine, and so long as to reach down

to the plank on which the directors are fixed, that is to say, six inches long (the directors are also to be made six inches broad above the plank). The rake-head should also fall a little before the crank is at its extremity, which will cause the rake to push forward to let the teeth come into the roots. The rake-teeth must drop in the same plane with the roller and wheels, or on the surface of the earth. No more space should be given from the roller C to the long teeth at G G than that the rake may just miss the spikes of the roller C and fall on the places before mentioned. As the first roller B was intended to cleanse the second C more than for any other use, it may be omitted when the machine is made in large, as Mr Ogden has lately found that the long teeth at G G answer the end alone, and this renders the machine about a sixth part shorter. Now, to suit any sort of earth, there should be to each machine three planks, with directors at different spaces, to use occasionally; in the first, the spaces between the directors should be eight inches wide, in the second six, and the third four. This will answer the same end as having so many machines.

As there may be some objections to the rake not leaving the roots when it has brought them up, Mr Ogden has several methods of cleansing it; but as he would make it as simple as possible, he chooses to let it be without them at present; but suppose it should bring some roots back again with it, it will probably lose them before it gets back to the extremity; whence they will lie light, and be of but little detriment to the others coming up. Mr Ogden would have the first machine made four feet six inches wide, the teeth divided into equal spaces, the outsides into half spaces.

7. The new-invented Patent Universal Sowing Machine.

THIS machine, whether made to be worked by hand, drawn by a horse, or fixed to a plough, and used with it, is extremely simple in the construction, and not liable to be put out of order; as there is but one movement to direct the whole, nor does it require any skill in working. It will sow wheat, barley, oats, rye, clover, cole-seed, hemp, flax, canary, rape, turnip, besides a great variety of other kinds of grain and seeds broad-cast, with an accuracy hitherto unknown. It is equally useful in the new husbandry, particularly when fixed to a plough; it will then drill a more extensive variety of grain, pulse, and seed (through every gradation, with regard to quantity), and deliver each kind with greater regularity than any drill-plough whatever. When used in this manner, it will likewise be found of the utmost service to farmers who are partial to the old husbandry, as, among many other very valuable and peculiar properties, it will not only sow in the broad-cast way with the most singular exactness, but save the expence of a seedsman; the seed being sown (either over or under furrow at pleasure), and the land ploughed, at the same operation.

Perhaps a fair and decisive experiment for ascertaining the superior advantage of broad-casting or drilling any particular crop, was never before so practicable; as the seed may now be put in with the utmost degree of regularity, in both methods of culture, by the same machine;

105
Universal
sowing
machine,
2d Plate VI
fig. 1. 2. 11.

Practice. machine; consequently, the seed will be sown in both cases with equal accuracy, without which it is impossible to make a just decision.

The excellence of this machine consists in spreading any given quantity of seed over any given number of acres with a mathematical exactness, which cannot be done by hand; by which a great saving may be made in feeding the ground, as well as benefiting the expected crop.

There has always been a difficulty in sowing turnip seed with any degree of exactness, both from the minuteness of the seed, and the smallness of the quantity required to be sown on an acre. Here the machine has a manifest advantage, as it may be set to sow the least quantity ever required on an acre; and with an accuracy the best seedsman can never attain to.

It will also sow clover, cole, flax, and every other kind of small seed, with the utmost degree of regularity.

It will likewise broad-cast beans, pease, and tares, or drill them with the greatest exactness, particularly when constructed to be used with a plough.

Another advantage attending the use of this machine is, that the wind can have no effect on the falling of the seed.

Fig. 2. *Of the Machine when made to be used without a Plough, and to be drawn by a Horse.*—It may in this case be made of different lengths at the desire of the purchaser. The upper part AAAA, contains the hoppers from which the grain or seed descends into the spouts. The several spouts all rest upon a bar, which hangs and plays freely by two diagonal supporters BB; a trigger fixed to this bar bears a catch wheel: this being fixed on the axle, occasions a regular and continual motion, or jogging of the spouts, quicker or slower in proportion to the pace the person sowing with it drives; and of course, if he quickens his pace, the bar will receive a greater number of strokes from the catch wheel, and the grain or seed will feed the faster. If he drives slower, by receiving fewer strokes, the contrary must take place. In going along the side of a hill, the strength of the stroke is corrected by a spring which acts with more or less power, in proportion as the machine is more or less from a horizontal position, and counteracts the difference of gravity in the bar, so that it presses, in all situations, with a proper force against the catch wheel. This spring is unnecessary if the land be pretty level. At the bottom of the machine is placed an apron or shelf in a sloping position, and the corn or seed, by falling thereon from the spouts above, is scattered about in every direction under the machine, and covers the ground in a most regular and uniform manner.

To sow the corn or seed in drills, there are moveable spouts (see fig. 10.), which are fixed on or taken off at pleasure, to direct the seed from the upper spout to the bottom of the furrow.

The machine is regulated for sowing any particular quantity of seed on an acre by a brass slider, A, fig. 7. fixed by screws against a brass bridge on each of the spouts. The machine is prevented from feeding while turning at the ends, by only removing the lever E, fig. 2. out of the channel G, to another at H, on the right hand of it, which carries back the bar from the catch wheel, and occasions the motion of the spouts to cease, and at the same time brings them upon a level N^o 7.

Practice. by the action of the diagonal supporters; so that no corn or seed can fall from them.

The machine in this form is particularly useful for broad-casting clover upon barley or wheat; or for sowing any other kind of seed, where it is necessary that the land should first be harrowed exceedingly fine and even.

Manner of using the Machine, when drawn by a Horse.—Place the machine about two feet from the ends of the furrows where you intend it shall begin to sow. Fill the hoppers with seed, and drive it forwards with the outside wheel in the first furrow. When you are at the end of the length, at the opposite side of the field, lift the lever E, fig. 2. into the channel H, and the machine will instantly stop sowing. Drive it on about two feet, and then turn. Fill the hoppers again if necessary; then remove the lever back again into the channel G, and in returning, let the outside wheel of the machine go one furrow within the tract which was made by it, in passing from the opposite end; as for example, if the wheel passed down the eighth furrow from the outside of the field, let it return in the seventh; and in every following length let the outside wheel always run one furrow within the tract made by the same wheel: because the breadth sown is about nine inches less than the distance between the wheels.

Let the machine be kept in a perpendicular situation. If the farmer wishes to sow more or less seed on any one part of the field than the other, it is only raising the handles a little higher, or sinking them a little lower than usual, and it will occasion a sufficient alteration; and should the last turn be less in breadth than the machine, those spouts which are not wanted may be taken up from the bar, and prevented from feeding, by turning the knob above them.

Also, when the land required to be sown has what is called a *vent*, that is, when the sides of the field run in an oblique line to the furrows, which by this means are unequal in length; the spots must be taken up or let down in succession by turning the knobs, as that part of the machine where they are placed arrives at the ends of the furrows. This is done while the machine is going forwards.

If the land be tolerably level, the machine may be fixed by the screw in the front, and the machine may then be used by any common harrow boy.

Method of regulating the Machine.—In each spout is fixed a bridge (see fig. 7.), with an aperture in it, B, for the grain or seed to pass through. This aperture is enlarged or contracted by a slider, A, which passes over it; and when properly fixed for the quantity of seed designed to be sown on an acre, is fastened by means of two strong screws firmly against the bridge. This is made use of in sowing all kinds of seed, where it is required to sow from one bushel upwards on an acre. To sow one, two, three gallons, or any of the intermediate quantities, as of clover, cole-seed, &c. the brass plate, fig. 6. is placed between the bridge and the slider, with the largest aperture B downwards, which aperture is enlarged or contracted by the slider as before. To sow turnips, the same plate is placed between the bridge and the slider, with its smallest aperture A downwards, and the hollow part about the same aperture inwards.

Fig. 8. is a view of the regulator, by which the apertures

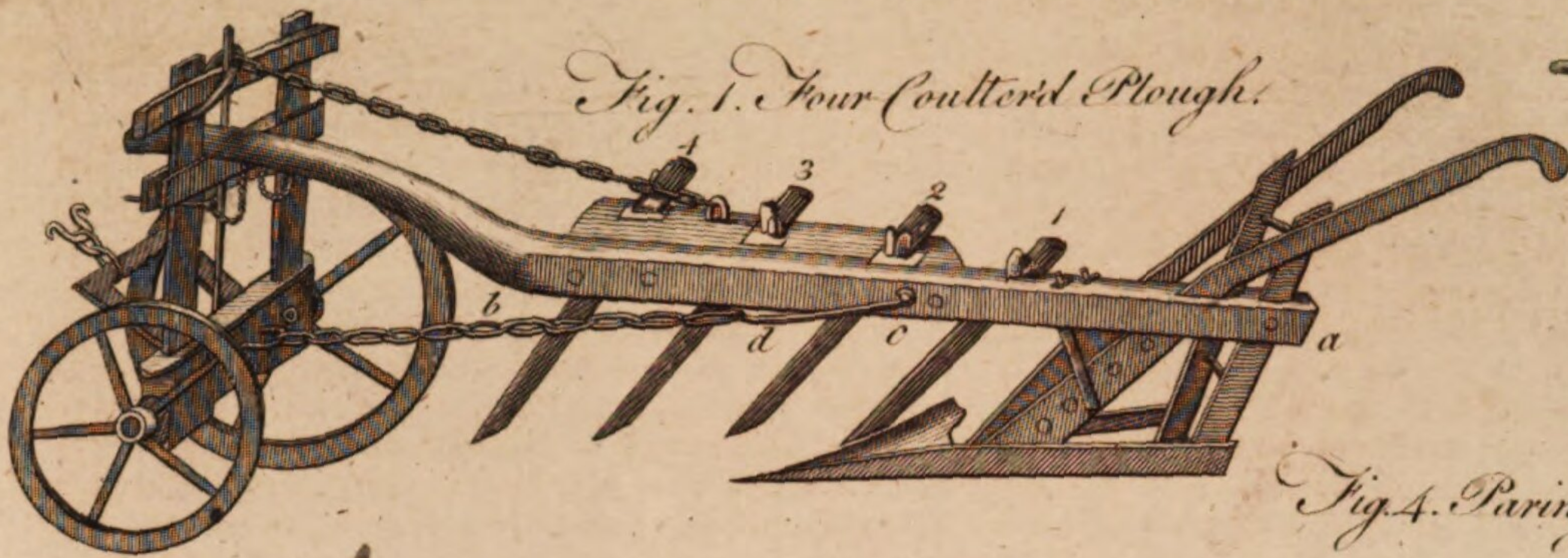


Fig. 4. Paring Plough.

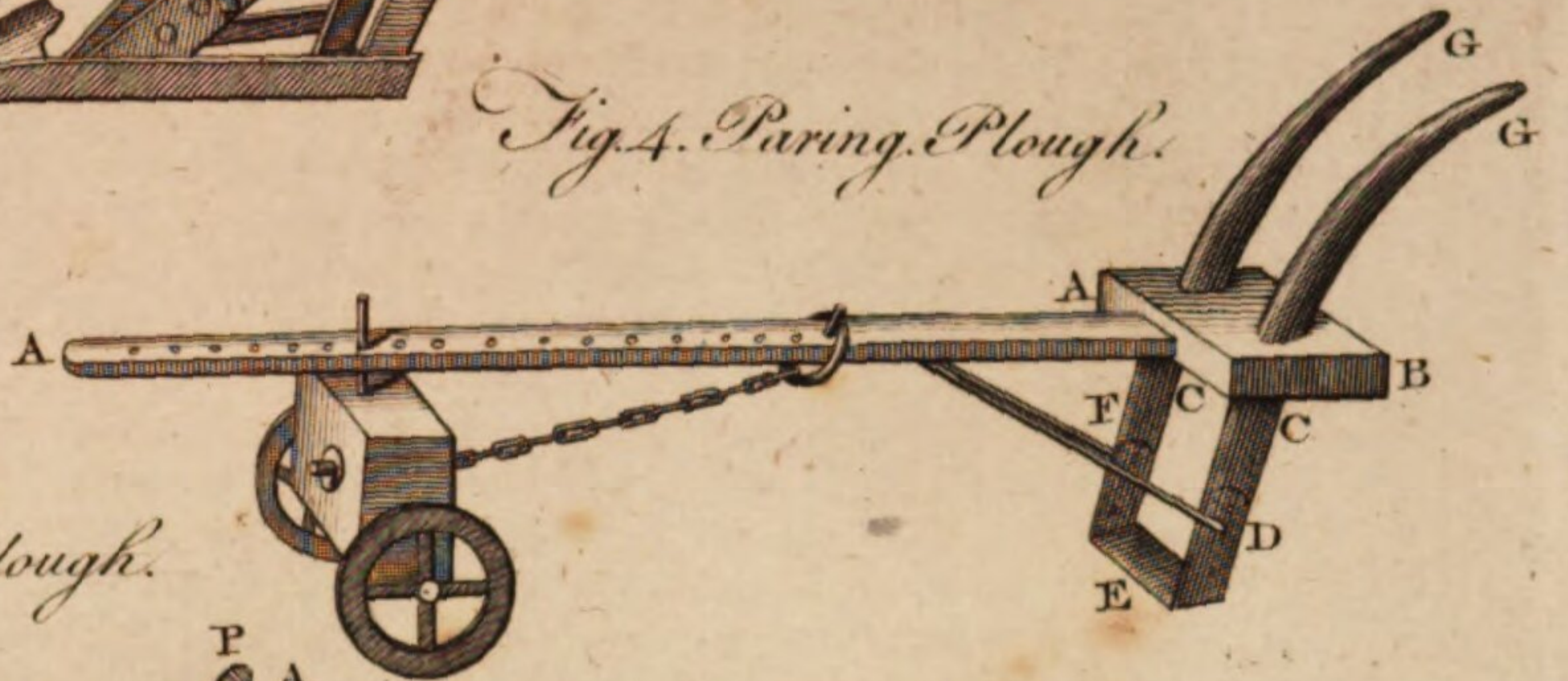


Fig. 3. Rotherham or Patent Plough.

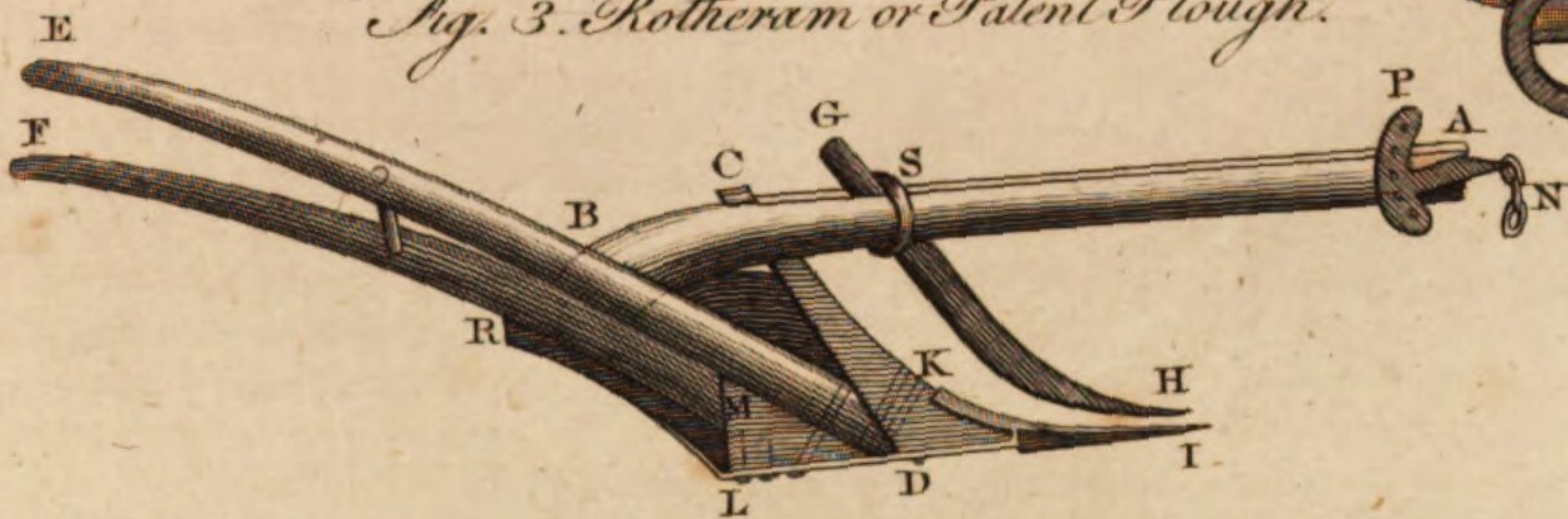


Fig. 5. Fallow cleansing Machine.

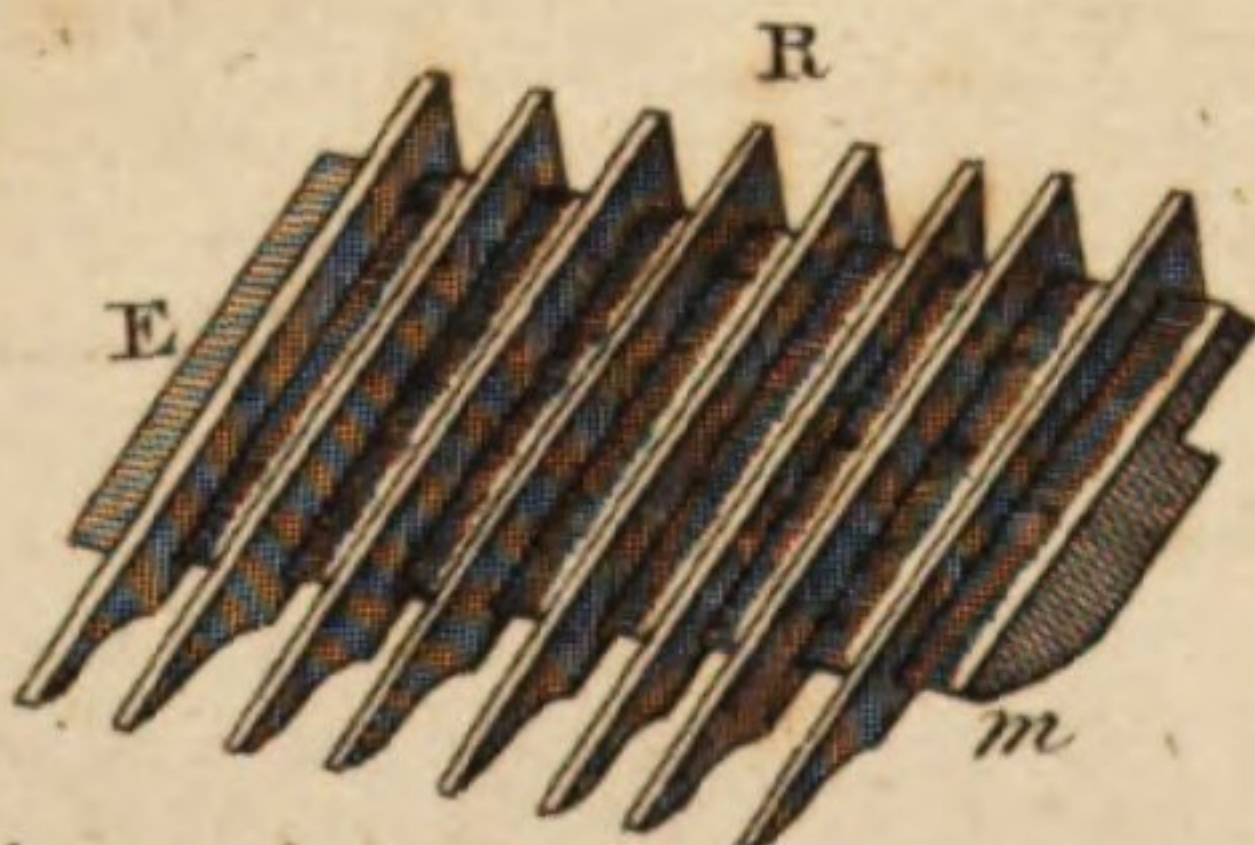
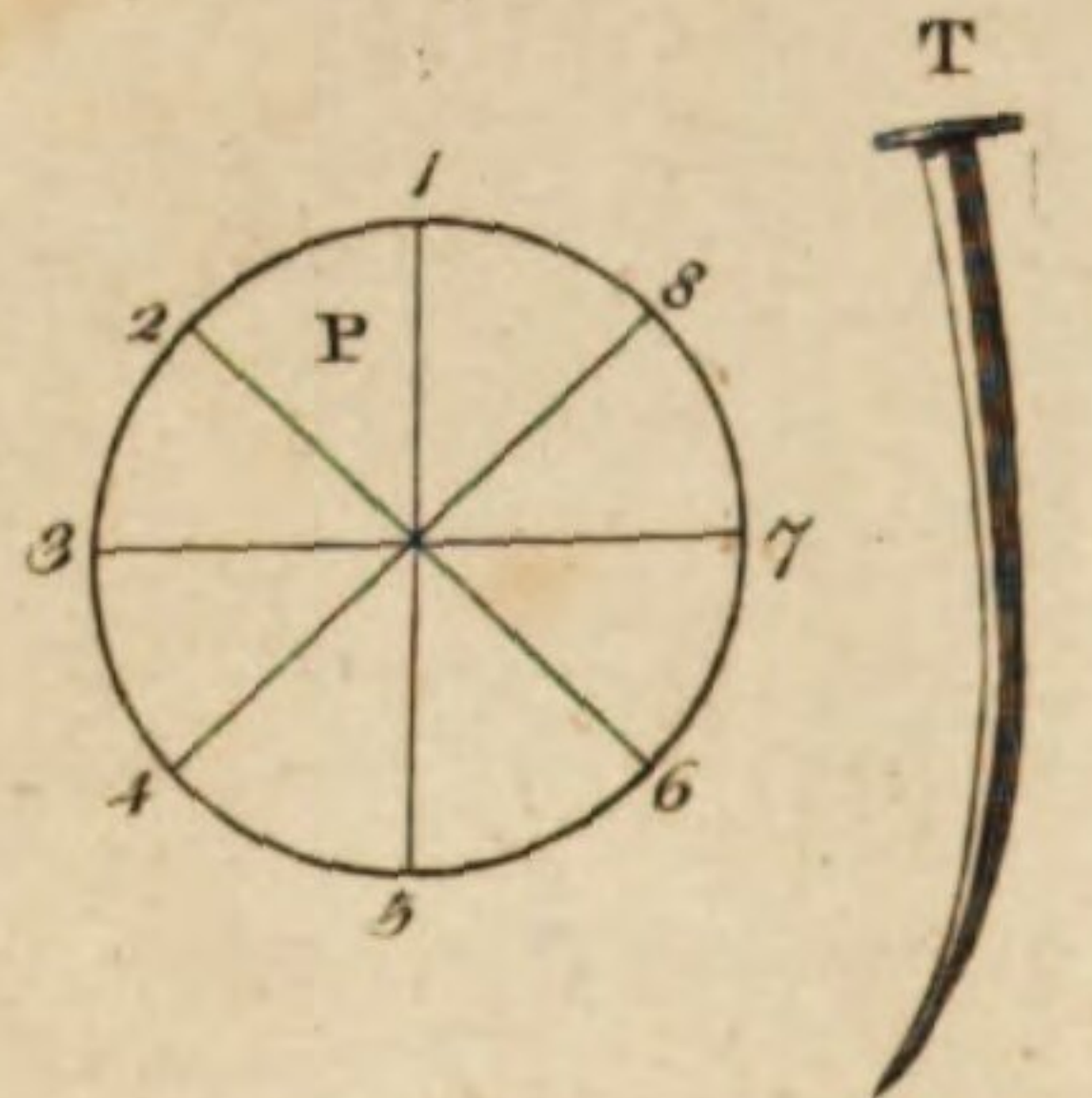
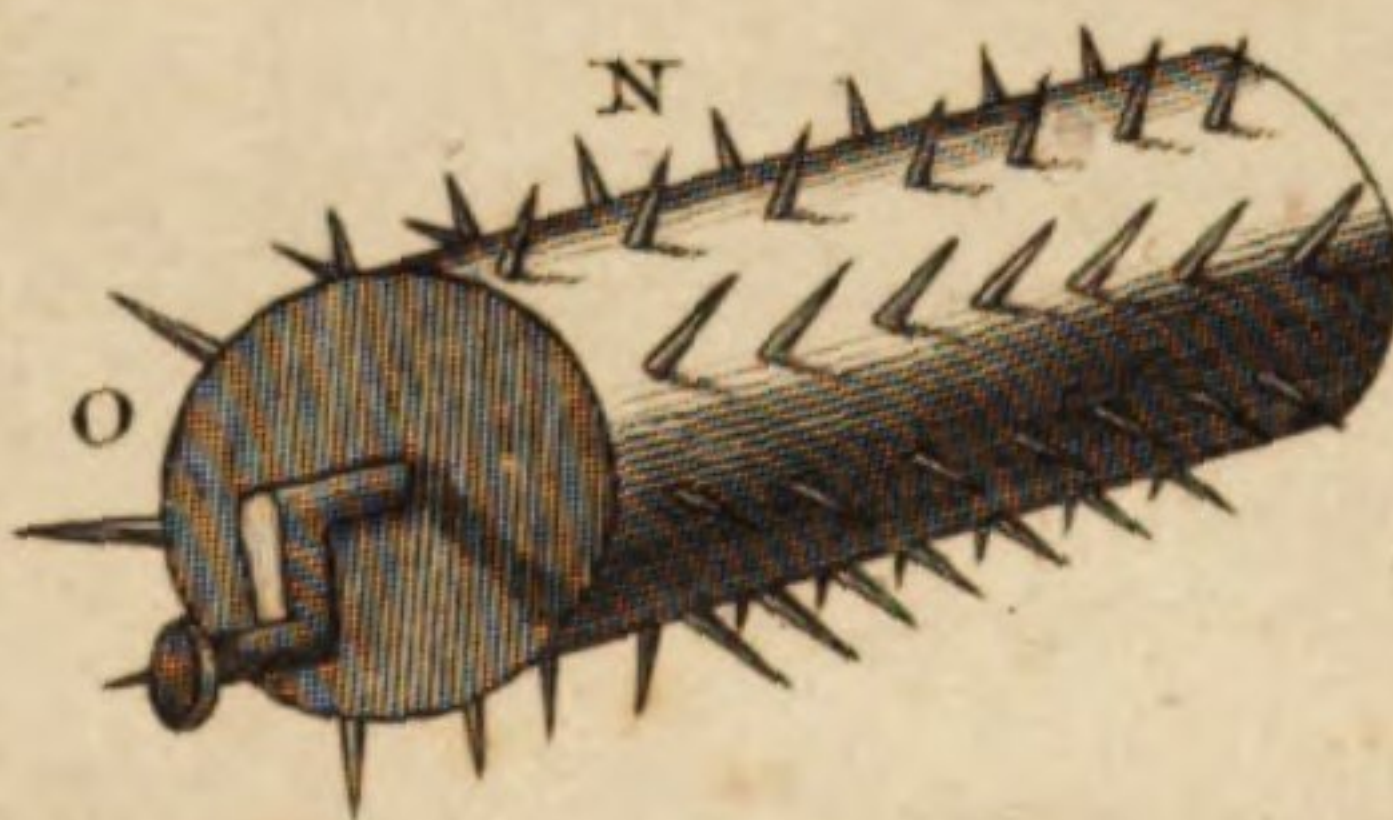
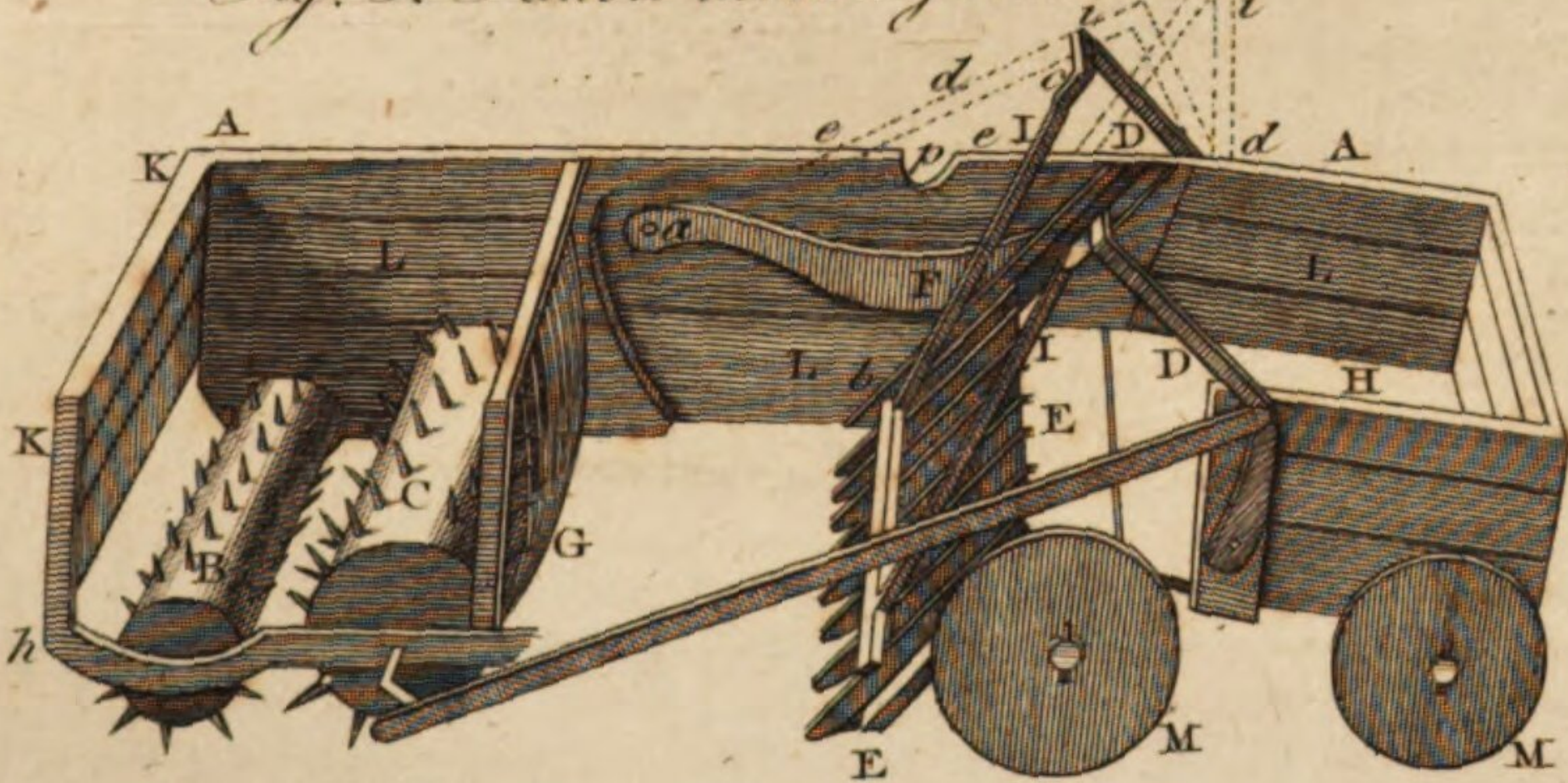
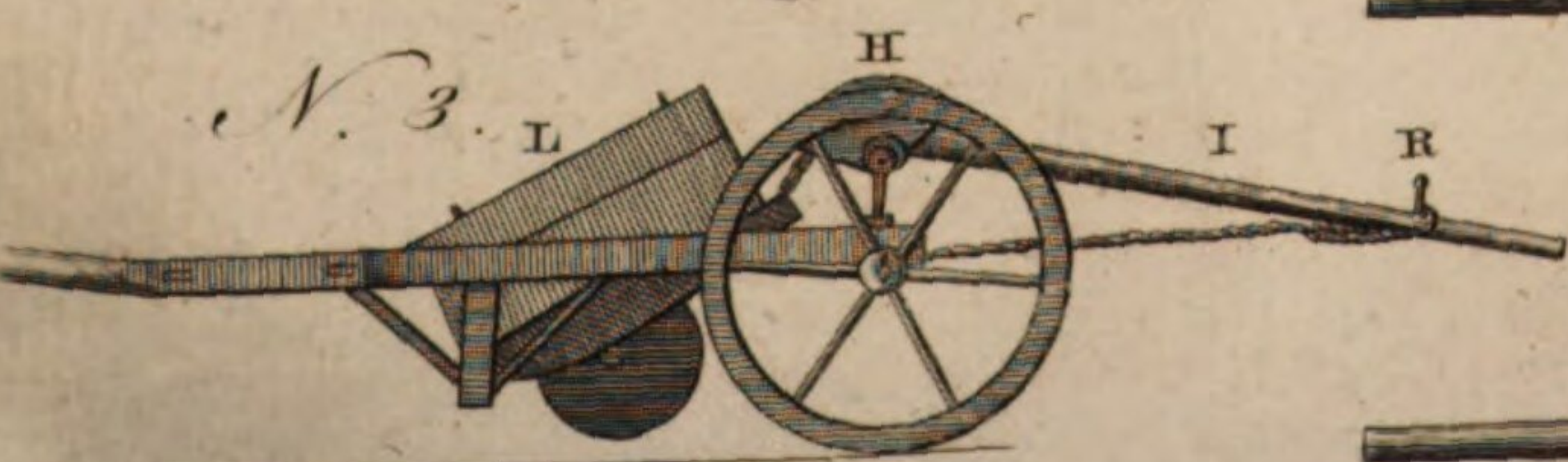
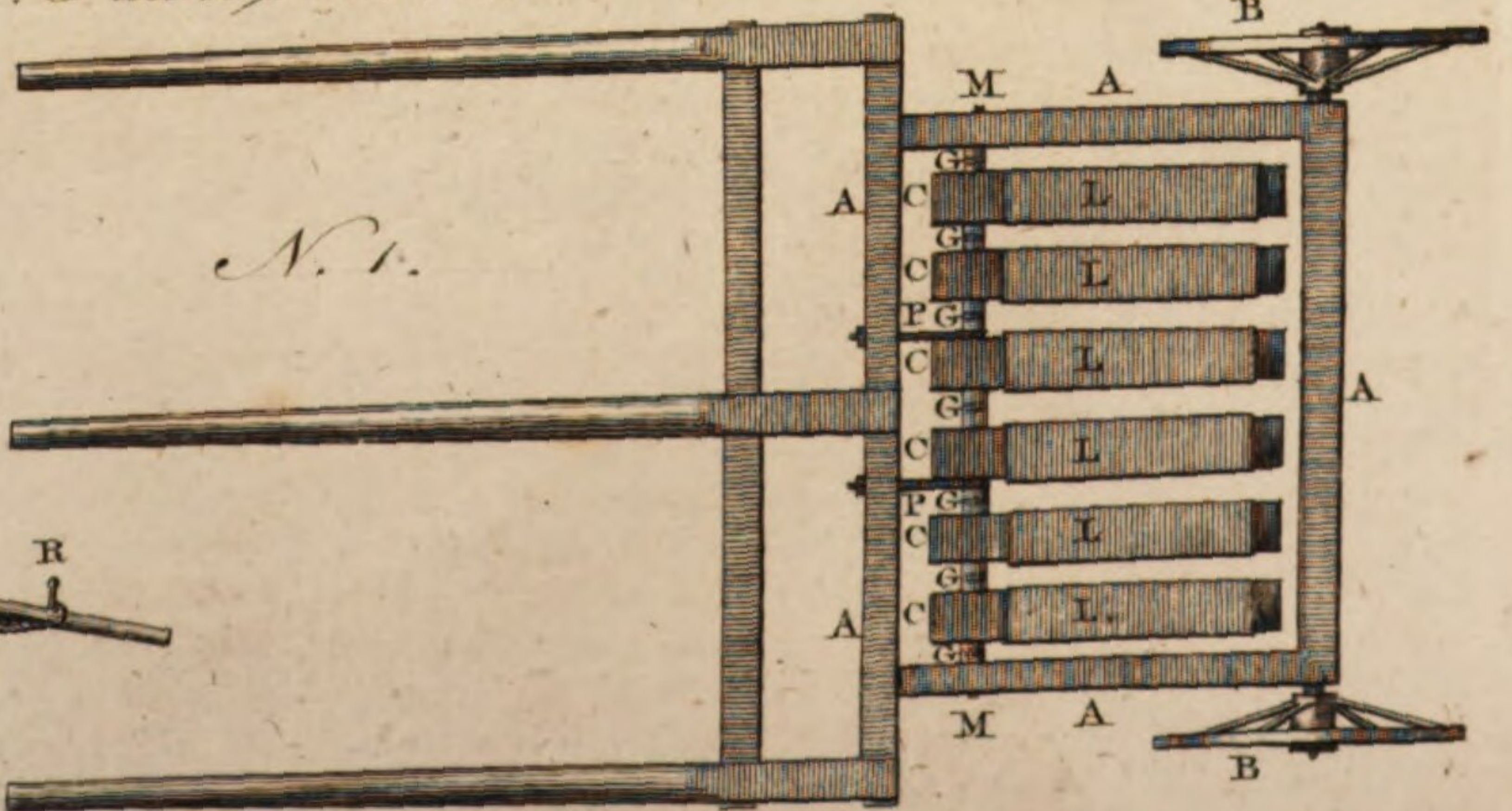
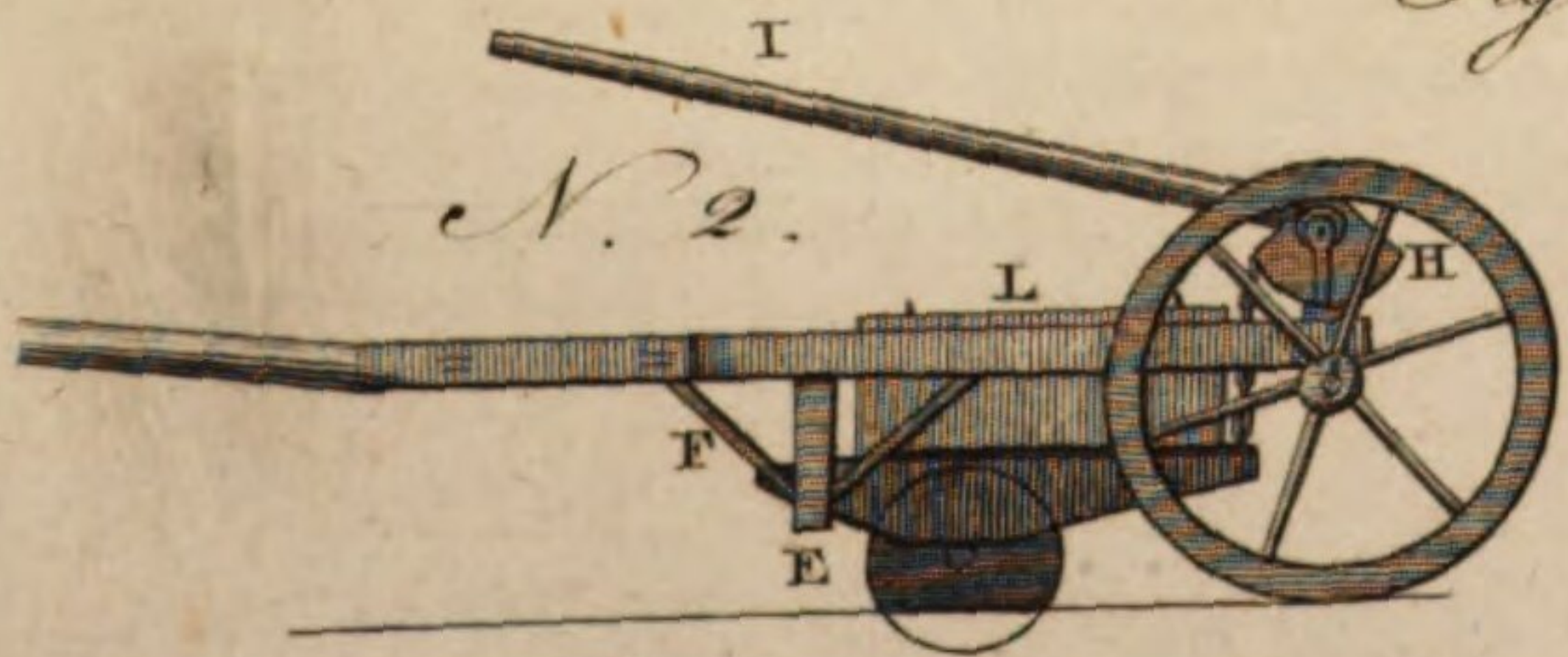


Fig. 6. Patent Sward cutter.



Practice. apertures in the several spouts are all set exactly alike, with the utmost ease, to make them feed equally. The extreme height of the largest aperture is equal to the breadth AB, and the breadth at C is equal to the height of the smallest aperture used, viz. that for turnips. The side AC is divided into 60 equal parts, and on it moves the slider or horse D; which being placed at any particular degree, according to the quantity of seed required to be sown on an acre, is fixed upon it, by a screw on the side of the slider or horse. When this is done, the end of the regulator is put through the aperture in the bridge or plate (whichever is intended to be used), and the slider against the bridge in the spout, raised by it, till it stops against the horse on the regulator; then the slider is fastened against the bridge firmly by the two screws; care being taken at the same time that it stands nearly square.

By this means the spouts (being all fixed in the same manner) will feed equally.

It is easy to conceive that the size of the apertures, and consequently the quantity of seed to be sown on an acre, may be regulated with a far greater accuracy than is required in common practice.

The spouts may be regulated with the utmost nicety, in five minutes, to sow each particular seed, for the whole season. But a little practice will enable any person, who possesses but a very moderate capacity, to make the spouts feed equally, even without using the regulator (A).

Of the Machine, when made to be used by Hand.—The difference of the machine in this case is, that it is made lighter, with but three spouts, without shafts, and is driven forwards by the handles. It hath also a bolt in front, which being pushed in by the thumb, releases the machine; so that it can then easily be placed in a perpendicular position. This alteration is necessary to keep the handles of a convenient height, in sowing up and down a hill, where the slope is considerable; and is done while the machine is turning at the end of the length. The method of regulating and using it is the same as when made to be drawn by a horse.

Of the Machine, when constructed to be used with a Plough.—This is, without doubt, the most useful application of the machine; and it can be fixed without difficulty to any kind of plough, in the same manner as to that represented in fig. 1.

The advantages arising from the use of it are great and numerous; for, beside the increase in the crop, which will be insured by the seeds being broad-cast with a mathematical nicety, a large proportion of seed (the value of which alone, in a few months, will amount

to more than the price of the machine) and the seedsman's labour will be saved. The seed may likewise be sown either under or over furrow; or one cast each way, as is practised by some farmers. The seed also, being cast by the machine upon the fresh ploughed land, may be immediately harrowed in, before the mould has lost any part of its moisture; which in a dry season will greatly promote the crop. In drilling any kind of grain, pulse, or seed, it possesses every property that can be wished for in the best drill-plough, nor will it (as most of them do) bruise the seed, or feed irregularly. The construction of the machine is the same as the large ones, except being made with one hopper and spout instead of several, and the apron moveable instead of being fixed, as may be seen by inspecting fig. 4. The only alteration necessary to make the machine broad-cast or drill is, in the former case to place the apron B, fig. 1, at the bottom of the machine, upon the hooks FF, sloping either towards the furrows or the unploughed land, according as it is intended to sow the seed, either over or under furrow. Whenever the apron is required to be shifted, it is done in less than a second of time; as it only requires to be moved up or down with the hand, when a catch fixes it.

To prepare it for drilling, instead of the apron, place the long spout, fig. 10. upon the brackets, on the front of the machine, by the ears AA, to receive the seed from the upper spout, and fasten the lower end of it, by a small cord, to that hook upon which the apron is hung for broad-casting, which is next the plough (see fig. 3;) the seed will then be directed by the long spout, to the centre of the furrow, near the heel of the plough. The spring for correcting the strength of the stroke, is necessary only when they are required to go along the side of a considerable declivity. The machine, when fixed to a plough, does not require the smallest degree of skill in using, as nothing is necessary but to keep the hopper filled, which will contain a sufficient quantity of seed to go upwards of 140 rods, before it will want re-filling, when three bushels and a half are sown on an acre. The accuracy with which it will broad-cast, may in some measure be conceived, by considering that the seed regularly descends upon the apron or shelf, and is from thence scattered upon the ground, in quantity exactly proportioned to the speed of the plough: also that each cast spreads to the third furrow; and by this means shuts upon the last. In this manner it is continually filling up till the whole field is completely covered; so that it is impossible to leave the smallest space without its proper quantity of seed.

When the plough is wanted for any other purpose,
N u the

(A) Proper directions are given with each machine for using it, as also for fixing the sliders to sow any particular quantity of corn or seed on an acre, so as to enable any person to set the spouts.

The prices of the machine (exclusive of the packing cases) are as follow. If constructed to be used with a single furrow plough; the wheel, with the axle and cheeks steered, strap, regulator, brass-plates for broad-casting or drilling turnips, lucerne, tares, wheat, barley, &c. &c. &c. and every article necessary for fixing it included, three guineas and a half. If made with a spring (for sowing on the side of a hill, where the slope is considerable), but which is very rarely necessary, five shillings more. If made to be fixed to any double-furrow plough, four guineas and a half.

The large machine, fig. 2. when made to broad-cast seven furrows at a time and to be drawn by a horse, eight guineas and a half. If constructed to sow five furrows at a time, and to be used by hand, six guineas. These are also five shillings more if made with a spring.

Practice. the machine, with the wheel at the heel of the plough for giving it motion, can be removed or replaced at any time in five minutes.

Fig. 11. represents the machine fixed to a double-furrow creasing plough, and prepared for drilling. As this plough may not be generally known, it will not be improper to observe, that it is chiefly used for creasing the land with furrows (after it has been once ploughed and harrowed); which method is necessary when the seed is to be sown broad-cast upon land that has been a clover-lay, &c. because, if the seed be thrown upon the rough furrows, a considerable part of it will fall between them, and be unavoidably lost, by laying too deep buried in the earth. This mode answers extremely well, and partakes of both methods of culture; the seed, though sown broad-cast, falling chiefly into the furrows.

The machine is very useful for sowing in this manner; as the seed is broad-cast, with an inconceivable regularity, at the time the land is creased. The advantages it likewise possesses for drilling all sorts of grain or seed with this plough, are too evident to need mentioning.

The machine, when constructed to be used with a double-furrow plough, is made with two upper and two long spouts for drilling, two aprons for broad-casting, and with a double hopper; but in other respects the same as when intended for a single furrow plough: it is used in all cases with the greatest ease imaginable.

The interval between the points of the two shares of a creasing plough is usually ten inches; the beam about nine feet long; and the whole made of a light construction.

2d Plate VII *A more particular explanation of the figures.*—Fig. 1. The machine fixed to a Kentish turn wrest plough. A, The machine. B, The apron upon which the seed falls and rebounds upon the land, in broad-casting. C, Lid to cover the hopper. D, Wheel at the heel of the plough. E, strap FF, Hooks, upon which the apron turns by a pivot on each side. G, Stay, to keep the machine steady. H, Lever, to prevent it from sowing.

Fig. 2. The machine constructed to be drawn by a horse. AAAA, The hoppers. BB, The diagonal supporters. CCCC, The upper spouts. D, The apron or shelf upon which the seed falls from the upper spouts. E, The lever, which carries back the bar, and prevents the machine from sowing. FF, Staples upon the handles, through which the reins pass, for the man who conducts the machine, to direct the horse by. I, Screw, to fix the machine occasionally. N B. The knobs (by turning which each particular spout may be taken from off the bar, and thereby prevented from feeding) are over each upper spout; but, to prevent confusion, are not lettered in the Plate.

Fig. 3. Is the same machine with that in fig. 1. The dotted lines, expressing the situation of the long spout, when the apron is removed, and the machine adapted for drilling.

Fig. 4. Also the same machine, with the front laid open to show the inside. A, The catch-wheel fixed upon the axle. BB, The axle upon which the machine hangs between the handles of the plough. C, The pulley, by which the strap from the wheel at the heel of the plough turns the catch-wheel. D, The bar,

Practice. upon which the upper spout rests, suspended by the diagonal supporters EE, bearing against the catch-wheel by the trigger F, and thereby kept in motion while the plough is going. G, The apron in a sloping position, upon which the corn or seed falls from the upper spout, and is scattered by rebounding upon the land. It turns upon pivots, and by this means throws the seed either towards the right hand or left at pleasure.

Fig. 5. The upper spout.

Fig. 6. The plate which is placed between the bridge and the slider, for sowing small seeds. The aperture A being downwards for sowing turnips; the larger one B downwards for sowing clover, &c.

Fig. 7. The bridge, fixed in the upper spouts. A, The slider, which contracts or enlarges the different apertures. B, The aperture in the bridge, through which the seed passes, when sowing any quantity from one bushel upwards on an acre.

Fig. 8. The regulator, made of brass. D, The slider or horse which moves upon it, and is fixed at any particular degree by a screw in its side.

Fig. 9. Represents the movement in the machine fig. 2. AAAA, Cleets, between which the upper spouts rest. BB, The diagonal supporters, by which the bar with the upper spouts hang. C, The catch-wheel. DD, The axle. E, The trigger upon the bar, which bears against the catch-wheel. FF, Stays from the back of the machine, by which the bar plays.

Fig. 10. The long spout. AA, The ears by which it hangs.

SECT. II. Preparing Land for Cropping.

1. OBSTRUCTIONS TO CROPPING.

IN preparing land for cropping, the first thing that occurs, is to consider the obstructions to regular ploughing. The most formidable of these, are stones lying above or below the surface, which are an impediment to a plough, as rocks are to a ship. Stones above the surface may be avoided by the ploughman, though not without loss of ground; but stones below the surface are commonly not discovered till the plough be shattered to pieces, and perhaps a day's work lost. The clearing land of stones is therefore necessary to prevent mischief. And to encourage the operation, it is attended with much actual profit. In the first place, the stones are useful for fences: when large they must be blown, and commonly fall into parts proper for building. And as the blowing, when gunpowder is furnished, does not exceed a halfpenny for each inch that is bored, these stones come generally cheaper than to dig as many out of the quarry. In the next place, as the soil round a large stone is commonly the best in the field, it is purchased at a low rate by taking out the stone. Nor is this a trifle; for not only is the ground lost that is occupied by a large stone, but also a considerable space round it, to which the plough has not access without danger. A third advantage is greater than all the rest; which is, that the ploughing can be carried on with much expedition, when there is no apprehension of stones: in stony land, the plough must proceed so slow, as not to perform half of its work.

To clear land of stones, is in many instances an undertaking

106
Obstructions, viz.
107
Stones.

Practice. *Wetness.* ¹⁰⁸dertaking too expensive for a tenant who has not a very long lease. As it is profitable both to him and to his landlord, it appears reasonable that the work should be divided, where the lease exceeds not nineteen years. It falls naturally upon the landlord to be at the expence of blowing the stones, and upon the tenant to carry them off the field.

Another obstruction is *wet ground*. Water may improve gravelly or sandy soils; but it sours (A) a clay soil, and converts low ground into a morass, unfit for any purpose that can interest the husbandman.

A great deal has been written upon different methods of draining land, most y so expensive as to be scarce fit for the landlord, not to mention the tenant.

One way of draining without expence when land is to be inclosed with hedge and ditch, is to direct the ditches so as to carry off the water. But this method is not always practicable, even where the divisions lie convenient for it. If the run of water be considerable, it will destroy the ditches, and lay open the fences, especially where the soil is loose or sandy.

If ditches will not answer, hollow drains are sometimes made, and sometimes open drains, which must be made so deep as to command the water. The former is filled up with loose stones, with brush-wood, or with any other porous matter that permits the water to pass. The latter is left open, and not filled up. To make the former effectual, the ground must have such a slope as to give the water a brisk course. To execute them in level ground is a gross error: the passages are soon stopped up with sand and sediment, and the work is rendered useless. This inconvenience takes not place in open drains; but they are subject to other inconveniences: They are always filling up, to make a yearly reparation necessary; and they obstruct both ploughing and pasturing.

The following is the best in all views. It is an open drain made with the plough, cleaving the space intended for the drain over and over, till the furrow be made of a sufficient depth for carrying off the water. The slope on either side may, by repeated ploughings, be made so gentle as to give no obstruction either to the plough or to the harrow. There is no occasion for a spade, unless to smooth the sides of the drain, and to remove accidental obstructions in the bottom. The advantages of this drain are manifold. It is executed at much less expence than either of the former; and it is perpetual, as it can never be obstructed. In level ground, it is true, grass may grow at the bottom of the drain; but to clear off the grass once in four or five years, will restore it to its original perfection. A hollow drain may be proper between the spring-head and the main drain, where the distance is not great; but in every other case the drain recommended is the best.

Where a level field is infested with water from higher ground, the water ought to be intercepted by a ditch carried along the foot of the high ground, and terminating in some capital drain.

The only way to clear a field of water that is hollow

Practice. in the middle, is to carry it off by some drain still lower. This is commonly the case of a morass fed with water from higher ground, and kept on the surface by a clay bottom.

A clay soil of any thickness is never pestered with springs; but it is pestered with rain, which settles on the surface as in a cup. The only remedy is high narrow ridges, well rounded. And to clear the furrows, the furrow of the foot-ridge ought to be considerably lower, in order to carry off the water cleverly. It cannot be made too low, as nothing hurts clay soil more than the stagnation of water on it; witness the hollows at the end of crooked ridges, which are absolutely barren. Some gravelly soils have a clay bottom; which is a substantial benefit to a field when in grass, as it retains moisture. But when in tillage, ridges are necessary to prevent rain from settling at the bottom; and this is the only case where a gravelly soil ought to be ridged.

Clay soils that have little or no level, have sometimes a gravelly bottom. For discharging the water, the best method is, at the end of every ridge to pierce down to the gravel, which will absorb the water. But if the furrow of the foot-ridge be low enough to receive all the water, it will be more expeditious to make a few holes in that furrow. In some cases, a field may be drained, by filling up the hollows with earth taken from higher ground. But as this method is expensive, it will only be taken where no other method answers. Where a field happens to be partly wet, partly dry, there ought to be a separation by a middle ridge, if it can be done conveniently; and the dry part may be ploughed while the other is drying.

The low part of Berwickshire is generally a brick clay, extremely wet and poachy during winter. This in a good measure may be prevented by proper inclosing, as there is not a field but can be drained into lower ground all the way down to the river Tweed. But as this would lessen the quantity of rain in a dry climate, such as is all the east side of Britain, it may admit of some doubt whether the remedy would not be as bad as the disease. (*See the article DRAINING.*)

2. Bringing into CULTURE, LAND from the STATE OF NATURE.

¹⁰⁹To improve a moor, let it be opened in winter when Moorish it is wet; which has one convenience, that the plough ground cannot be employed at any other work. In spring, after frost is over, a slight harrowing will fill up the seams with mould, to keep out the air, and rot the sod. In that state let it lie the following summer and winter, which will rot the sod more than if laid open to the air by ploughing. Next April, let it be cross-ploughed, braked, and harrowed, till it be sufficiently pulverized. Let the manure laid upon it, whether lime or dung, be intimately mixed with the soil by repeated harrowings. This will make a fine bed for turnip-seed if sown broad-cast. But if drills be intended, the method must

N n 2

be

(A) By this expression it is not meant that the ground really becomes acid, but only that it becomes unfit for the purposes of vegetation. The natural products of such a soil are rushes and *sour-grass*: which last appears in the furrows, but seldom in the crown of the ridge; is dry and tasteless like a chip of wood; and feels rough when stroked backwards.

Practice. be followed that is directed afterward in treating more directly of the culture of turnip.

110
Swampy
ground.

A successful turnip-crop, fed on the ground with sheep, is a fine preparation for laying down a field with grass-seeds. It is an improvement upon this method, to take two or three successive crops of turnip, which will require no dung for the second and following crops. This will thicken the soil, and enrich it greatly.

The best way of improving swampy ground after draining, is paring and burning. But where the ground is dry, and the soil so thin as that the surface cannot be pared, the best way of bringing it into tilth from the state of nature, as mentioned above, is to plough it with a feathered sock, laying the grassy surface under. After the new surface is mellowed with frost, fill up all the seams by harrowing cross the field, which by excluding the air will effectually rot the sod. In this state let it lie summer and winter. In the beginning of May after, a cross-ploughing will reduce all to small square pieces, which must be pulverized with the brake, and make it ready for a May or June crop. If these square pieces be allowed to lie long in the lap without breaking, they will become tough and not be easily reduced.

3. Forming RIDGES.

III
Of ridges.

THE first thing that occurs on this head, is to consider what grounds ought to be formed into ridges, and what ought to be tilled with a flat surface. Dry soils, which suffer by lack of moisture, ought to be tilled flat, which tends to retain moisture. And the method for such tilling, is to go round and round from the circumference to the centre, or from the centre to the circumference. This method is advantageous in point of expedition, as the whole is finished without once turning the plough. At the same time, every inch of the soil is moved, instead of leaving either the crown or the furrow unmoved, as is commonly done in tilling ridges. Clay soil, which suffers by water standing on it, ought to be laid as dry as possible by proper ridges. A loamy soil is the middle between the two mentioned. It ought to be tilled flat in a dry country, especially if it incline to the soil first mentioned. In a moist country, it ought to be formed into ridges, high or low according to the degree of moisture and tendency to clay.

In grounds that require ridging, an error prevails, that ridges cannot be raised too high. High ridges labour under several disadvantages. The soil is heaped upon the crown, leaving the furrows bare: the crown is too dry, and the furrows too wet: the crop, which is always best on the crown, is more readily shaken with the wind, than where the whole crop is of an equal height: the half of the ridge is always covered from the sun, a disadvantage which is far from being slight in a cold climate. High ridges labour under another disadvantage in ground that has no more level than barely sufficient to carry off water: they sink the furrows below the level of the ground; and consequently retain water at the end of every ridge. The furrows ought never to be sunk below the level of the ground. Water will more effectually be carried off by lessening the ridges both in height and breadth: a

narrow ridge, the crown of which is but 18 inches higher than the furrow, has a greater slope than a very broad ridge where the difference is three or four feet.

Practice.

Next, of forming ridges where the ground hangs considerably. Ridges may be too steep as well as too horizontal: and if to the ridges be given all the steepness of a field, a heavy shower may do irreparable mischief. To prevent such mischief, the ridges ought to be so directed cross the field, as to have a gentle slope for carrying off water slowly, and no more. In that respect, a hanging field has greatly the advantage of one that is nearly horizontal; because in the latter, there is no opportunity of a choice in forming the ridges. A hill is of all the best adapted for directing the ridges properly. If the soil be gravelly, it may be ploughed round and round, beginning at the bottom and ascending gradually to the top in a spiral line. This method of ploughing a hill, requires no more force than ploughing on a level; and at the same time removes the great inconvenience of a gravelly hill, that rains go off too quickly; for the rain is retained in every furrow. If the soil be such as to require ridges, they may be directed to any slope that is proper.

In order to form a field into ridges, that has not been formerly cultivated, the rules mentioned are easily put in execution. But what if ridges be already formed, that are either crooked or too high? After seeing the advantage of forming a field into ridges, people were naturally led into an error, that the higher the better. But what could tempt them to make their ridges crooked? Certainly this method did not originate from design; but from the laziness of the driver suffering the cattle to turn too hastily, instead of making them finish the ridge without turning. There is more than one disadvantage in this slovenly practice. First, the water is kept in by the curve at the end of every ridge, and sours the ground. Next, as a plough has the least friction possible in a straight line, the friction must be increased in a curve, the back part of the mouldboard pressing hard on the one hand, and the coulter pressing hard on the other. In the third place, the plough moving in a straight line, has the greatest command in laying the earth over. But where the straight line of the plough is applied to the curvature of a ridge in order to heighten it by gathering, the earth moved by the plough is continually falling back, in spite of the most skilful ploughman.

The inconveniences of ridges high and crooked are so many, that one would be tempted to apply a remedy at any risk. And yet, if the soil be clay, it would not be advisable for a tenant to apply the remedy upon a lease shorter than two nineteen years. In a dry gravelly soil, the work is not difficult nor hazardous. When the ridges are cleaved two or three years successively in the course of cropping, the operation ought to be concluded in one summer. The earth, by reiterated ploughings, should be accumulated upon the furrows, so as to raise them higher than the crowns: they cannot be raised too high, for the accumulated earth will subside by its own weight. Cross-ploughing once or twice, will reduce the ground to a flat surface, and give opportunity to form ridges at will. The same method brings down ridges in clay soil: only let care be taken to carry on the work with expedition; because

Practice. cause a hearty shower, before the new ridges are formed, would soak the ground in water, and make the farmer suspend his work for the remainder of that year at least. In a strong clay, we would not venture to alter the ridges, unless it can be done to perfection in one season. On this subject Mr Anderson has the following observations *.

• *Essays on Agriculture*, Vol. I. p. 146

112 Inconveniences in the common methods of levelling.

"The difficulty of performing this operation properly with the common implements of husbandry, and the obvious benefit that accrues to the farmer from having his fields level, has produced many new inventions of ploughs, harrows, drags, &c. calculated for speedily reducing the fields to that state; none of which have as yet been found fully to answer the purpose for which they were intended, as they all indiscriminately carry the earth that was on the high places into those that were lower; which, although it may, in some cases, render the surface of the ground tolerably smooth and level, is usually attended with inconveniences far greater, for a considerable length of time, than that which it was intended to remove.

113 Vegetable mould becomes inert by being long buried.

"For experience sufficiently shows, that even the best vegetable mould, if buried for any length of time so far beneath the surface as to be deprived of the benign influences of the atmosphere, loses its *vis vitæ*, if I may be allowed that expression; becomes an inert, lifeless mass, little fitted for nourishing vegetables; and constitutes a soil very improper for the purposes of the farmer. It therefore behoves him, as much as in him lies, to preserve, on every part of his fields, an equal covering of that vegetable mould that has long been uppermost, and rendered fertile by the meliorating influence of the atmosphere. But, if he suddenly levels his high ridges by any of these mechanical contrivances, he of necessity buries all the good mould that was on the top of the ridges in the old furrows; by which he greatly impoverishes one part of his field, while he too much enriches another; insomuch that it is a matter of great difficulty, for many years thereafter, to get the field brought to an equal degree of fertility in different places; which makes it impossible for the farmer to get an equal crop over the whole of his field by any management whatever: and he has the mortification frequently, by this means, to see the one half of his crop rotted by an over-luxuriance, while other parts of it are weak and sickly, or one part ripe and ready for reaping, while the other is not properly filled; so that it were, on many occasions, better for him to have his whole field reduced at once to the same degree of poorness as the poorest of it, than have it in this state. An almost impracticable degree of attention in spreading the manures may indeed in some measure get the better of this: but it is so difficult to perform this properly, that I have frequently seen fields that had been thus levelled, in which, after thirty years of continued culture and repeated dressings, the marks of the old ridges could be distinctly traced when the corn was growing, altho' the surface was so level that no traces of them could be perceived when the corn was off the ground.

"But this is a degree of perfection in levelling that cannot be usually attained by following this mode of practice; and, therefore, is but seldom seen. For all that can be expected to be done by any levelling ma-

chine, is to render the surface perfectly smooth and even in every part, at the time that the operation is performed: but as, in this case, the old hollows are suddenly filled up with loose mould to a great depth, while the earth below the surface upon the heights of the old ridges remain firm and compact, the new-raised earth after a short time subsides very much, while the other parts of the field do not sink at all; so that in a short time the old furrows come to be again below the level of the other parts of the field, and the water of course is suffered in some degree to stagnate upon them; in so much that, in a few years, it becomes necessary once more to repeat the same levelling process, and thus renew the damage that the farmer sustains by this pernicious operation.

"On these accounts, if the farmer has not a long lease, it will be found in general to be much his interest to leave the ridges as he found them, rather than to attempt to alter their direction; and, if he attends with due caution to moderate the height of these old ridges, he may reap very good crops, although perhaps at a somewhat greater expence of labour than he would have been put to upon the same field, if it had been reduced to a proper level surface, and divided into straight and parallel ridges.

"But, where a man is secure of possessing his ground for any considerable length of time, the advantages that he will reap from having level and well laid out fields, are so considerable as to be worth purchasing, if it should even be at a considerable expence. But the loss that is sustained at the beginning, by this mechanical mode of levelling ridges, if they are of considerable height, is so very great, that it is perhaps doubtful if any future advantages can ever fully compensate it. I would therefore advise, that all this levelling apparatus should be laid aside; and the following more efficacious practice be substituted in its stead: A practice that I have long followed with success, and can safely recommend as the very best that has yet come to my knowledge.

"If the ridges have been raised to a very great height, as a preparation for the ensuing operations, they may be first *cloven*, or *scalded* out, as it is called in different places; that is, ploughed so as to lay the earth on each ridge from the middle towards the furrows. But if they are only of a moderate degree of height, this operation may be omitted. When you mean to proceed to level the ground, let a number of men be collected, with spades, more or fewer as the nature of the ground requires, and then set a plough to draw a furrow directly across the ridges of the whole field intended to be levelled. Divide this line into as many parts as you have labourers, allotting to each one ridge or two, or more or less, according to their number, height, and other circumstances. Let each of the labourers have orders, as soon as the plough has passed that part assigned him, to begin to dig in the bottom of the furrow that the plough has just made, about the middle of the side of the old ridge, keeping his face towards the old furrow, working backwards till he comes to the height of the ridge, and then turn towards the other furrow, and repeat the same on the other side of the ridge, always throwing the earth that he digs up into the deep old furrow between the ridges,

114

Levelling sometimes not to be attempted.

115

Best method of levelling.

Practice.

ges, that is directly before him; taking care not to dig deep where he first begins, but to go deeper and deeper as he advances to the height of the ridge, so as to leave the bottom of the trench he thus makes across the ridge entirely level, or as nearly so as possible. And when he has finished that part of the furrow allotted to him that the plough has made in going, let him then go and finish in the same manner his own portion of the furrow that the plough makes in returning. In this manner, each man performs his own task through the whole field, gradually raising the old furrows as the old heights are depressed. And, if an attentive overseer is at hand, to see that the whole is equally well done, and that each furrow is raised to a greater height than the middle of the old ridges, so as to allow for the subsiding of that loose earth, the operation will be entirely finished at once, and never again need to be repeated.

"In performing this operation, it will always be proper to make the ridges, formed for the purpose of levelling, which go across the old ridges, as broad as possible; because the deep trench that is thus made in each of the furrows are an impediment in the future operations, as well as the height that is accumulated in the middle of each of these ridges; so that the fewer there are of these, the better it is. The farmer, therefore, will do well to advert to this in time, and begin by forming a ridge by always turning the plough to the right hand, till it becomes of such a breadth as makes it very inconvenient to turn longer in that manner; and then, at the distance of twice the breadth of this new-formed ridge from the middle of it, mark off a furrow for the middle of another ridge, turning round it to the right hand, in the same manner as was done in the former, till it becomes of the same breadth with it; and then, turning to the left hand, plough out the interval that was left between the two new-formed ridges. By this mode of ploughing, each ridge may be made of 40 or 50 or 60 yards in breadth, without any great inconvenience; for although some time will be lost in turning at the ends of these broad ridges, yet as this operation is only to be once performed in this manner, the advantage that is reaped by having few open furrows, is more than sufficient to counterbalance it. And, in order to moderate the height that would be formed in the middle of each of these great ridges, it will always be proper to mark out the ridges, and draw the furrow that is to be the middle of each some days before you collect your labourers to level the field; that you may, without any hurry or loss of labour, clear out a good trench through the middle of each of the old ridges; as the plough at this time going and returning nearly in the same track, prevents the labourers from working properly without this precaution.

"If these rules are attended to, your field will be at once reduced to a proper level, and the rich earth that formed the surface of the old ridges be still kept upon the surface of your field; so that the only loss that the possessor of such ground can sustain by this operation, is merely the expence of performing it."

He afterwards makes a calculation of the different

6

expences of levelling by the plough and by the spade, in which he finds the latter by far the cheapest method.

Let it be a rule to direct the ridges north and south, if the ground will permit. In this direction, the east and west sides of the ridges, dividing the sun equally between them, will ripen at the same time.

It is a great advantage in agriculture, to form ridges so narrow, and so low, as to admit the crowns and furrows to be changed alternately every crop. The soil nearest the surface is the best; and by such ploughing, it is always kept near the surface, and never buried. In high ridges, the soil is accumulated at the crown and the furrows left bare. Such alteration of crown and furrow, is easy where the ridges are no more but seven or eight feet broad. This mode of ploughing answers perfectly well in sandy and gravelly soils, and even in loam; but it is not safe in clay soil. In that soil, the ridges ought to be 12 feet wide, and 20 inches high; to be preserved always in the same form by casting, that is, by ploughing two ridges together, beginning at the furrow that separates them, and ploughing round and round till the two ridges be finished. By this method, the separating furrow is raised a little higher than the furrows that bound the two ridges. But at the next ploughing, that inequality is corrected, by beginning at the bounding furrows, and going round and round till the ploughing of the two ridges be completed at the separating furrow.

4. CLEARING GROUND OF WEEDS.

For this purpose a new instrument, termed a *cleaning harrow*, has been introduced by Lord Kames, and is strongly recommended (B). It is one entire piece like the first of those mentioned above, consisting of seven bulls, four feet long each, two and one-fourth inches broad, two and three-fourths deep. The bulls are united together by sheths, similar to what are mentioned above. The intervals between the bulls being three and three-fourths inches, the breadth of the whole harrow is three feet five inches. In each bull are inserted eight teeth, each nine inches free below the wood, and distant from each other six inches. The weight of each tooth is a pound, or near it. The whole is firmly bound by an iron plate from corner to corner in the line of the draught. The rest as in the harrows mentioned above. The size, however, is not invariable. The cleaning harrow ought to be larger or less according as the soil is stiff or free.

To give this instrument its full effect, stones of such a size as not to pass freely between the teeth ought to be carried off, and clods of that size ought to be broken. The ground ought to be dry, which it commonly is in the month of May.

In preparing for barley, turnip, or other summer-crop, begin with ploughing and cross-ploughing. If the ground be not sufficiently pulverized, let the great brake be applied, to be followed successively with the 1st and 2d harrows. In stiff soil, rolling may be proper, or twice between the acts. These operations will loosen every root, and bring some of them to the surface.

This

(B) In his *Gentleman Farmer*; to which performance the practical part of this article is materially indebted.

Practice. This is the time for the 3d harrow, conducted by a boy mounted on one of the horses, who trots smartly along the field, and brings all the roots to the surface:

Fig. 5.

there they are to lie for a day or two, till perfectly dry. If any stones or clods remain, they must be carried off in a cart. And now succeeds the operation of the cleaning harrow. It is drawn by a single horse, directed by reins, which the man at the opposite corner puts over his head, in order to have both hands free. In this corner is fixed a rope, with which the man from time to time raises the harrow from the ground, to let the weeds drop. For the sake of expedition, the weeds ought to be dropt in a straight line cross the field, whether the harrow be full or not; and seldom is a field so dirty but that the harrow may go 30 yards before the teeth are filled. The weeds will be thus laid in parallel rows, like those of hay raked together for drying. A harrow may be drawn swiftly along the rows, in order to shake out all the dust; and then the weeds may be carried clean off the field in carts. But we are not yet done with these weeds: instead of burning, which is the ordinary practice, they may be converted into useful manure, by laying them in a heap with a mixture of hot dung to begin fermentation. At first view, this way of cleaning land will appear operose; but, upon trial, neither the labour nor expence will be found immoderate. At any rate, the labour and expence ought not to be grudged; for if a field be once thoroughly cleaned, the seasons must be very cross, or the farmer very indolent, to make it necessary to renew the operation in less than 20 years. In the worst seasons, a few years pasture is always under command; which effectually destroys triennial plants, such as thistles and couch-grass.

5. On the Nature of different Kinds of SOILS, and the PLANTS proper to each.

1. CLAY, which is in general the stiffest of all soils, and contains an unctuous quality. But under the term *clays*, earths of different sorts and colours are included. One kind is so obstinate, that scarcely any thing will subdue it; another is so hungry and poor, that it absorbs whatever is applied, and turns it into its own quality. Some clays are fatter than others, and the fattest are the best; some are more soft and slippery. But all of them retain water poured on their surfaces, where it stagnates, and chills the plants, without sinking into the soil. The closeness of clay prevents the roots and fibres of plants from spreading in search of nourishment. The blue, the red, and the white clay, if strong, are unfavourable to vegetation. The stony and looser sort are less so; but none of them are worth any thing till their texture is so loosened by a mixture of other substances, and opened, as to admit the influence of the sun, the air, and frosts. Among the manures recommended for clay, sand is of all others to be preferred; and sea-sand the best of all where it can be obtained: This most effectually breaks the cohesion.

The reason for preferring sea-sand is, that it is not formed wholly (as most other sands are) of small stones; but contains a great deal of calcareous matter in it, such as, shells grated and broken to pieces by the tide; and also of salts. The smaller the sand is the more

easily it penetrates the clay; but it abides less time in it than the larger.

The next best sand is that washed down by rains on gravelly soils. Those which are dry and light are the worst. Small gritty gravel has also been recommended by the best writers on agriculture for these soils; and in many instances we have found them to answer the purpose.

Shell marle, ashes, and all animal and vegetable substances, are very good manures for clay; but they have been found most beneficial when sand is mixed with them. Lime has been often used, but the writer of this section would not recommend it, for he never found any advantage from it singly, when applied to clays.

The crops most suitable for such lands are, wheat, beans, cabbages, and rye-grass. Clover seldom succeeds, nor indeed any plants whose roots require depth, and a wide spread in the earth.

2. Chalk. Chalky soils are generally dry and warm, and if there be a tolerable depth of mould, fruitful; producing great crops of barley, rye, pease, vetches, clover, trefoil, burnet, and particularly saintfoin. The latter plant flourishes in a chalky soil better than any other. But if the surface of mould be very thin, this soil requires good manuring with clay, marle, loam, or dung. As these lands are dry, they may be sown earlier than others.

When your barley is three inches high, throw in 10 lb. of clover, or 15 lb. of trefoil, and roll it well. The next summer mow the crop for hay; feed off the aftermath with sheep; and in winter give it a top-dressing of dung. This will produce a crop the second spring, which should be cut for hay. As soon as this crop is carried off, plough up the land, and in the beginning of September sow three bushels of rye per acre, either to feed off with sheep in the spring or to stand for harvest. If you feed it off, sow winter vetches in August or September, and make them into hay the following summer. Then get the land into as fine tilth as possible, and sow it with saintfoin, which, with a little manure once in two or three years, will remain and produce good crops for 20 years together.

3. Light poor land, which seldom produces good crops of any thing till well manured. After it is well ploughed, sow three bushels of buck-wheat per acre, in April or May: When in bloom, let your cattle in a few days to eat off the best, and tread the other down; this done, plough in what remains immediately. This will soon ferment and rot in the ground; then lay it fine, and sow three bushels of rye per acre. If this can be got off early enough, sow turnips; if not, winter vetches to cut for hay. Then get it in good tilth and sow turnip-rooted cabbages, in rows three feet apart. This plant seldom fails, if it has sufficient room, and the intervals be well horse-hoed; and you will find it the best spring-feed for sheep when turnips are over.

The horse-hoeing will clean and prepare the land for saintfoin; for the sowing of which April is reckoned the best season. The usual way is to sow it broad-cast, four bushels to an acre; but the writer prefers sowing it in drills two feet asunder; for then it may be horse-hoed, and half the seed will be sufficient.

The

Practice.

The horse-hoeing will not only clean the crop, but earth up the plants, and render them more luxuriant and lasting.

If you sow it broad-cast, give it a top-dressing in December or January, of rotten dung or ashes, or, which is still better, of both mixed up in compost.

From various trials, it is found that taking only one crop in a year, and feeding the after-growth, is better than to mow it twice. Cut it as soon as it is in full bloom, if the weather will permit. The hay will be the sweeter, and the strength of the plants less impaired, than if it stands till the seed is formed.

4. Light rich land, being the most easy to cultivate to advantage, and capable of bearing most kinds of grain, pulse, and herbage, little need be said upon it. One thing however is very proper to be observed, that such lands are the best adapted to the drill husbandry, especially where machines are used, which require shallow furrows to be made for the reception of the seed. This, if not prone to couch-grass, is the best of all soils for lucerne; which, if sown in two feet drills, and kept clean, will yield an astonishing quantity of the most excellent herbage. But lucern will never be cultivated to advantage where couch-grass and weeds are very plentiful; nor in the broad-cast method, even where they are not so; because horse-hoeing is essential to the vigorous growth of this plant.

5. Coarse rough land. Plough deep in autumn; when it has lain two weeks, cross-plough it, and let it lie rough through the winter. In March give it another good ploughing; drag, rake, and harrow it well, to get out the rubbish, and sow four bushels of black oats per acre if the soil be wet, and white oats if dry. When about four inches high, roll them well after a shower: This will break the clods; and the fine mould falling among the roots of the plants will promote their growth greatly.

Some sow clover and rye-grass among the oats, but this appears to be bad husbandry. If you design it for clover, sow it single, and let a coat of dung be laid on in December. The snow and rain will then dilute its salts and oil, and carry them down among the roots of the plants. This is far better than mixing the crops on such land, for the oats will exhaust the soil so much that the clover will be impoverished. The following summer you will have a good crop of clover, which cut once, and feed the after-growth. In the winter plough it in, and let it lie till February: Then plough and harrow it well; and in March, if the soil be moist, plant beans in drills of three feet, to admit the horse hoe freely. When you horse-hoe them a second time, sow a row of turnips in each interval, and they will succeed very well. But if the land be strong enough for sowing wheat as soon as the beans are off, the turnips may be omitted.

SECT. III. Culture of particular Plants.

119

THE articles hitherto insisted on, are all of them preparatory to the capital object of a farm, that of raising plants for the nourishment of man, and of other animals. These are of two kinds; culmiferous and leguminous; differing widely from each other. Wheat, rye, barley, oats, rye-grass, are of the first No 8.

kind: of the other kind are, pease, beans, clover, cabbage, and many others.

Practice.

Culmiferous plants, says Bonnet, have three sets of roots. The first issue from the seed, and push to the surface an upright stem; another set issue from a knot in that stem; and a third from another knot, nearer the surface. Hence the advantage of laying seed so deep in the ground as to afford space for all the sets.

120
Culmiferous plants.

Leguminous plants form their roots differently. Pease, beans, cabbage, have store of small roots, all issuing from the seed, like the undermost set of culmiferous roots; and they have no other roots. A potato and a turnip have bulbous roots. Red clover has a strong tap root. The difference between culmiferous and leguminous plants with respect to the effects they produce in the soil, will be insisted on afterward, in the section concerning rotation of crops. As the present section is confined to the propagation of plants, it falls naturally to be divided into three articles: first, Plants cultivated for fruit; second, Plants cultivated for roots; third, Plants cultivated for leaves.

121

Leguminous plants.

I. Plants Cultivated for Fruit.

1. WHEAT and RYE.

122

ANY time from the middle of April to the middle of May, the fallowing for wheat may commence. The moment should be chosen, when the ground, beginning to dry, has yet some remaining softness: in that condition, the soil divides easily by the plough, and falls into small parts. This is an essential article, deserving the strictest attention of the farmer. Ground ploughed too wet, rises, as we say, *whole-fur*, as when pasture-ground is ploughed: where ploughed too dry, it rises in great lumps, which are not reduced by subsequent ploughings; not to mention, that it requires double force to plough ground too dry, and that the plough is often broken to pieces. When the ground is in proper order, the farmer can have no excuse for delaying a single minute. This first course of fallow must, it is true, yield to the barley-feed; but as the barley-feed is commonly over the first week of May, or sooner, the season must be unfavourable if the fallow cannot be reached by the middle of May.

Fallowing for wheat.

As clay soil requires high ridges, these ought to be cleaved at the first ploughing, beginning at the furrow, and ending at the crown. This ploughing ought to be as deep as the soil will admit: and water-furrowing ought instantly to follow; for if rain happen before water-furrowing, it stagnates in the furrow, necessarily delays the second ploughing till that part of the ridge be dry, and prevents the furrow from being mellowed and roasted by the sun. If this first ploughing be well executed, annual weeds will rise in plenty.

About the first week of June, the great brake will loosen and reduce the soil, encourage a second crop of annuals, and raise to the surface the roots of weeds moved by the plough. Give the weeds time to spring, which may be in two or three weeks. Then proceed to the second ploughing about the beginning of July; which must be cross the ridges, in order to reach all the slips of the former ploughing. By cross-ploughing the furrows will be filled up, and water furrowing be still more necessary than before. Employ the brake again about the 10th of August, to destroy the annuals that

Practice. that have sprung since the last stirring. The destruction of weeds is a capital article in fallowing: yet so blind are people to their interest, that nothing is more common than a fallow field covered with charlock and wild mustard, all in flower, and 10 or 12 inches high. The field having now received two harrowings and two breakings is prepared for manure, whether lime or dung, which without delay ought to be incorporated with the soil by a repeated harrowing and a gathering furrow. This ought to be about the beginning of September, and as soon after as you please the seed may be sown.

As in ploughing a clay soil it is of importance to prevent poaching, the hinting furrows ought to be done with two horses in a line. If four ploughs be employed in the same field, to one of them may be allotted the care of finishing the hinting furrows.

123
Dressing
loam for
wheat.

Loam, being a medium between sand and clay, is of all soils the fittest for culture, and the least subject to chances. It does not hold water like clay; and when wet, it dries sooner. At the same time, it is more retentive than sand of that degree of moisture which promotes vegetation. On the other hand, it is more subject to couch-grass than clay, and to other weeds; to destroy which, fallowing is still more necessary than in clay.

Beginning the fallow about the first of May, or as soon as barley-seed is over, take as deep a furrow as the soil will admit. Where the ridges are so low and narrow as that the crown and furrow can be changed alternately, there is little or no occasion for water furrowing. Where the ridges are so high as to make it proper to cleave them, water furrowing is proper. The second ploughing may be at the distance of five weeks. Two crops of annuals may be got in the interim, the first by the brake and the next by the harrow; and by the same means eight crops may be got in the season. The ground must be cleared of couch-grass and knot-grass roots, by the cleaning harrow described above. The time for this operation is immediately before the manure is laid on. The ground at that time being in its loosest state, parts with its grass roots more freely than at any other time. After the manure is spread, and incorporated with the soil by brakeing or harrowing, the seed may be sown under furrow, if the ground hang so as easily to carry off the moisture. To leave it rough without harrowing has two advantages: it is not apt to cake with moisture, and the inequalities make a sort of shelter to the young plants against frost. But if it lie flat, it ought to be smoothed with a slight harrow after the seed is sown, which will facilitate the course of the rain from the crown to the furrow.

124
Dressing a
sandy soil.

A sandy soil is too loose for wheat. The only chance for a crop is after red clover, the roots of which bind the soil; and the instructions above given for loam are applicable here. Rye is a crop much fitter for sandy soil than wheat; and like wheat, it is generally sown after a summer-fallow.

125
Time for
sowing.

Lastly, Sow wheat as soon in the month of October as the ground is ready. When sown a month more early, it is too forward in the spring, and apt to be hurt by frost; when sown a month later, it has not time to root before frost comes on, and frost spews it out of the ground.

Setting of wheat, a method which is reckoned one
Vol. I. Part I.

of the greatest improvements in husbandry that has taken place this century. It seems to have been first suggested by planting grains in a garden from mere curiosity, by persons who had no thought or opportunity of extending it to a lucrative purpose. Nor was it attempted on a larger scale, till a little farmer near Norwich began it about 17 years since, upon less than an acre of land. For two or three years only a few followed his example; and these were generally the butt of their neighbours merriment for adopting so singular a practice. They had, however, considerably better corn and larger crops than their neighbours: this, together with the saving in seed, engaged more to follow them: while some ingenious persons, observing its great advantage, recommended and published its utility in the Norwich papers. These recommendations had their effect. The curiosity and inquiry of the Norfolk farmers (particularly round Norwich) were excited, and they found sufficient reason to make general experiments. Among the rest was one of the largest occupiers of lands in this county, who set 57 acres in one year. His success, from the visible superiority of his crop, both in quantity and quality, was so great, that the following autumn he set 300 acres and has continued the practice ever since. This noble experiment established the practice, and was the means of introducing it generally among the intelligent farmers in a very large district of land; there being few who now sow any wheat, if they can procure hands to set it. It has been generally observed, that although the set crops appear very thin during the autumn and winter, the plants tiller and spread prodigiously in the spring. The ears are indisputably larger, without any dwarfish or small corn; the grain is of a larger bulk, and specifically heavier per bushel than when sown.

The lands on which this method is particularly prosperous, are either after a clover stubble, or on which trefoil and grass-seed were sown the spring before the last. These grounds, after the usual manuring, are once turned over by the plough in an extended flag or turf, at ten inches wide; along which a man, who is called a *dibbler*, with two setting-irons, somewhat bigger than ram-rods, but considerably bigger at the lower end, and pointed at the extremity, steps backwards along the turf and makes the holes about four inches asunder every way, and an inch deep. Into these holes the droppers (women, boys, and girls) drop two grains, which is quite sufficient. After this, a gate bushed with thorns is drawn by one horse over the land, and closes up the holes. By this mode, three pecks of grain is sufficient for an acre; and being immediately buried, it is equally removed from vermin or the power of frost. The regularity of its rising gives the best opportunity of keeping it clear from weeds, by weeding or hand-hoeing.

Wheat-setting is a method peculiarly beneficial when corn is dear; and, if the season be favourable, may be practised with great benefit to the farmer. Sir Thomas Bevor of Hethel-Hall in Norfolk, found the produce to be two bushels per acre more than from the wheat which is sown; but having much less small corn intermixed with it, the sample is better, and always fetches a higher price, to the amount generally of two shillings per quarter.

O o

This

Practice.

126

Setting of
wheat.

127

A capital
improve-
ment in a-
griculture.

128

Method.

129

Peculiar
advantages.

Practice.

This method, too, saves to the farmer and to the public six pecks of seed-wheat in every acre; which, if nationally adopted, would of itself afford bread for more than half a million of people.

Add to these considerations, the great support given to the poor by this *second* harvest, as it may be called, which enables them to discharge their rents and maintain their families without having recourse to the parish.—The expence of setting by hand is now reduced to about six shillings per acre; which, in good weather, may be done by one dibbler, attended by three droppers, in two days. This is five shillings per day; of which, if the dibbler gives to the children sixpence each, he will have himself three shillings and sixpence for his day's work, which is much more than he can possibly earn by any other labour so easy to himself. But put the case, that the man has a wife who dabbles with him, and two or three of his own children to drop to him, you see his gains will then be prodigious, and enough to ensure a plenty of candidates for that work, even in the least populous parts of the country.

It is, however, to be observed with regard to this method, that in seasons when seed-corn is very cheap, or the autumn particularly unfavourable to the practice, it must certainly be lessened. In light lands, for instance, a very dry time prevents dibbling; as the holes made with the instruments will be filled up again by the mould as fast as the instrument is withdrawn. So, again, in a very wet season, on strong and stiff clays, the seeds in the holes cannot be well and properly covered by the bushes drawn over them. But these extremes of dry and wet do not often happen, nor do they affect lands of a moderately consistent texture, or both light and heavy soils at the same time, so that the general practice is in fact never greatly impeded by them.

130
Propagating of
wheat by
dividing
the roots.

Propagating of wheat by dividing and transplanting its roots. In the Philosophical Transactions for 1768, we meet with a very extraordinary experiment, of which the following is an abstract. On the 2d of June 1766, Mr C. Miller sowed some grains of the common red wheat; and on the 8th of August a single plant was taken up and separated into 18 parts, and each part planted separately. These plants having pushed out several side-shoots, by about the middle of September some of them were then taken up and divided, and the rest of them between that time and the middle of October. This second division produced 67 plants. These plants remained through the winter, and another division of them, made between the middle of March and the 12th of April, produced 500 plants. They were then divided no further, but permitted to remain. The plants were in general stronger than any of the wheat in the fields. Some of them produced upwards of 100 ears from a single root. Many of the ears measured seven inches in length, and contained between 60 and 70 grains.

The whole number of ears which, by the process above mentioned, were produced from one grain of wheat, was 21,109, which yielded three pecks and three quarters of clear corn, the weight of which was 47 lb. 7 ounces; and from a calculation made by counting the number of grains in an ounce, the whole number of grains was about 576,840.

By this account we find, that there was only one general division of the plants made in the spring. Had

a second been made, Mr Miller thinks the number of plants would have amounted to 2000 instead of 500, and the produce thereby much enlarged.

The ground was a light blackish soil, upon a gravelly bottom; and, consequently, a bad soil for wheat. One half of the ground was well dunged, the other half had no manure. There was, however, not any difference discoverable in the vigour, or growth, or produce, of the plants.

It must be evident, that the expence and labour of setting in the above manner by the hand, will render it impracticable upon a large scale so as to be productive of any utility. A correspondent of the Bath Society, therefore (Robert Bogle, Esq; of Daldowin, near Glasgow), with a view to extend the practice, has proposed the use of the harrow and roller until some better implements be invented. This method occurred to him from attending to the practice usual with farmers on certain occasions, of harrowing their fields after the grain is sprung up. Upon investigating the principles upon which these practices are founded, he found them confined merely to that of pulverising the earth, without any attention to Mr Miller's doctrine. They said, "that after very heavy rains, and then excessive dry weather, the surface of their lands were apt to be caked, the tender fibres of the young roots were thereby prevented from pushing, and of course the vegetation was greatly obstructed; in such instances, they found very great benefit from harrowing and rolling."

These principles he acknowledges to be well founded, so far as relates to pulverising; but contends, that the benefit arising from harrowing and rolling is not derived from pulverising entirely, but also from subdividing and enabling the plants to tiller (as it is termed). "The harrow (he observes) certainly breaks the incrustation on the surface, and the roller crumbles the clods; but it is also obvious, that the harrow removes a great many of the plants from their original stations; and that if the corn has begun to tiller at the time it is used, the roots will be, in many instances, subdivided, and then the application of my system of divisibility comes into play. The roller then serves to plant the roots which have been torn up by the harrow."

But on this the Society observe, that the teeth of a harrow are too large to divide roots so small and tenacious as are those of grain; and whenever such roots (however tillered) stand in the line any tooth makes, they will, if small, be only turned on one side by the earth yielding to their lateral pressure, or, if large, the whole root will probably be drawn out of the ground. The principal uses, therefore, derived from harrowing and rolling these crops are, opening the soil between the plants, earthing them up, breaking the clods, and closing the earth about their roots.

In a subsequent letter, Mr Bogle, without contesting these points, further urges the scheme of propagating wheat by dividing and transplanting its roots. "I have conversed (says he) much with many practical farmers, who all admit that my plan has the appearance not only of being practical, but advantageous. I have also seen in the ninth number of Mr Young's Annals of Agriculture, the account of an experiment which strongly corroborates my theory. It was made by the Rev. Mr Pike of Edmonton. From this, and other experiments

131
Method
proposed by
Mr Bogle.

132
Objections.

Practice. experiments which have been made under my own eye, I foresee clearly, that the system is practicable, and will certainly be productive of great benefit, should it become general. Besides the saving of nine-tenths of seed in the land sown broad-cast, other very important advantages will attend the setting out of wheat from a seed-bed, such as an early crop; the certainty of good crops; rendering a summer fallow unnecessary; saving dung; and having your wheat perfectly free from weeds without either hand or horse-hoeing. Five hundred plants in April produced almost a bushel of grain. My gardener says, he can set one thousand plants in a day, which is confirmed by the opinion of two other gardeners. Mr Miller found no difference in the produce of what was planted on lands that had dung, and on what had none, except where the land was improper for wheat at all."

133 **Practicability of the scheme ascertained.**

134 **Bath Society's observations.** On this letter we have the following note by the society: "Mr Bogle will see, by the society's premium-book this year, that by having offered several premiums for experiments of the kind he so earnestly recommends, we wish to have his theory brought to the test of practice. Our reason for this, as well as for printing Mr B's letter, was rather to excite decisive trials by ingenious persons, than from any expectation of the practice ever becoming a general one. General, indeed, it never can be. A sufficient number of hands could not be found to do it. Unkindly seasons at the time of transplanting and dividing the roots would frequently endanger and injure, if not destroy the crops. But admitting the mode generally practicable, we very much doubt whether all the advantages he has enumerated would be derived from this mode of culture. Why should dividing and transplanting the roots of wheat cause the crop to be early, or afford a *certainly* of its being a *good one*? We cannot think that *less manure* is necessary in this method, than either in drilling or broad-cast; nor can we by any means admit, that such crops would "be perfectly free from weeds without either hand or horse-hoeing." We readily agree with Mr Bogle, that by this mode of culture on a general scale, an immense quantity of seed-corn would be annually saved to the nation; and in this, we believe, the advantage, were it practicable, would principally consist."

135 **Further observations of Mr Bogle.** Upon the same subject, and that of harrowing all kinds of corn, we are informed, Mr Bogle afterwards communicated to the Society his thoughts more at large, together with authentic accounts which were made at his instance, and which were attended with very great success. These, however, were received too late for publication in the last (3d) volume of their papers. But the society, conceiving his system may be attended with considerable advantages if brought into general practice, have given, at the end of the volume, a few of his leading principles. Mr Bogle states, 1. That he has known many instances of very great crops having been obtained by harrowing fields of corn after they were sprouted; and therefore recommends the practice very warmly.

2. That he has also received an authentic account of one instance where the same good effects were produced by ploughing the field.

3. On the system of transplanting, he states, that a very great proportion of the seed will be saved, as a farmer may have a nursery, or small patch of plants,

from which his fields may be supplied; he calculates that one acre will yield plants sufficient for 100 acres.

4. That a very great increase of crops may be obtained by this method, probably a double crop, nay perhaps a triple quantity of wheat is reaped either by drilling, or by the broad-cast husbandry.

5. That a great part of the labour may be performed by infirm men and women, and also by children, who are at present supported by the parish charity; and that of course the poor's rates may be considerably reduced.

6. That the expence will not exceed from 20s. to 30s. per acre, if the work be performed by able-bodied men and women; but that it will be much lower, if that proportion of the work which may be done by employing young boys and girls should be allotted to them.

7. That in general he has found the distance of nine inches every way a very proper distance for setting out the plants at; but recommends them to be tried at other spaces, such as six, eight, or even 12 inches.

8. That he conceives an earlier crop may be obtained in this manner than can be obtained by any other mode of cultivation.

9. That a clean crop may also be procured in this way, because if the land be ploughed immediately before the plants are set out, the corn will spring much quicker from the plants than the weeds will do from their seeds, and the corn will thereby bear down the growth of the weeds.

10. That such lands as are overflowed in the winter and spring, and are of course unfit for sowing with wheat in the autumn, may be rendered fit for crops of wheat by planting them in the spring, or even in the summer.

11. That he has known instances of wheat being transplanted in September, October, November, February, March, April, and even as late as the middle of May, which have all answered very well.

12. That he has known an early kind of wheat sown as late as the middle of May, which has ripened in very good time; and from that circumstance he conceives, if the plants should be taken from that early kind, the season of transplanting might be prolonged at least till the 1st of July, perhaps even later.

13. That he has reason to think wheat, oats, and barley, are not annuals, but are perennials, provided they are eaten down by cattle and sheep, or are kept low by the scythe or sickle; and are prevented from spindling or coming to the ear.

14. That one very prevalent motive with him in prosecuting this plan, is, that he is of opinion it may enable Government to devise means of supporting the vagrant poor, both old and young, who are now to be met with every where, both in towns and in the country, and who are at present a burden on the community: but if such employment could be struck out for them, a comfortable subsistence might be provided for them by means of their own labour and industry; and not only save the public and private charitable contributions, but may also render that class of people useful and profitable subjects; instead of their remaining in a useless, wretched, and perhaps a profligate and vicious course of life.

Lastly, Mr Bogle has hinted at a secondary object which

Practice.

which he has in view, from this mode of cultivation, which he apprehends may in time, with a small degree of attention, prove extremely advantageous to agriculture.—It is, that in the first place, the real and intrinsic value of different kinds of grain may be more accurately ascertained by making a comparison of it with a few plants of each kind set out at the same time, than can be done when sown in drills or broad-cast; and when the most valuable kinds of wheat, oats, or barley, are discovered, he states, that in a very short time (not exceeding four or five years) a sufficient quantity of that valuable kind may be procured to supply the kingdom with seed from a single grain of each kind; for he calculates, that 47,000 grains of wheat may be produced by divisibility in two years and three months.

136
Observation of the Bath Society.

Upon these propositions the Society observes, "That although Mr Bogle appears to be too sanguine in his expectations of seeing his plan realized in *general practice*, it certainly merits the attention of Gentlemen Farmers. We wish them to make fair experiments, and report their success. Every grand improvement has been, and ever will be, progressive. They must necessarily originate with gentlemen: and thence the circle is extended by almost imperceptible degrees over provinces and countries. At all events, Mr Bogle is justly intitled to the thanks of the Society, and of the public, for the great attention he has paid to the subject."

2. OATS.

137
Effect of frost upon tilled land.

As winter-ploughing enters into the culture of oats, we must remind the reader of the effect of frost upon tilled land. Providence has neglected no region intended for the habitation of man. If in warm climates the soil be meliorated by the sun, it is no less meliorated by frost in cold climates. Frost acts upon water, by expanding it into a larger space. Frost has no effect upon dry earth; witness sand, upon which it makes no impression. But upon wet earth it acts most vigorously: it expands the moisture, which requiring more space puts every particle of the earth out of its place, and separates them from each other. In that view, frost may be considered as a plough superior to any that is made, or can be made, by the hand of man: its action reaches the minutest particles; and, by dividing and separating them, it renders the soil loose and friable. This operation is the most remarkable in tilled land, which gives free access to frost. With respect to clay-soil in particular, there is no rule in husbandry more essential than to open it before winter in hopes of frost. It is even advisable in a clay-soil to leave the stubble rank; which, when ploughed in before winter, keeps the clay loose, and admits the frost into every cranny.

To apply this doctrine, it is dangerous to plough clay-soil when wet; because water is a cement for clay, and binds it so as to render it unfit for vegetation. It is, however, less dangerous to plough wet clay before winter than after. A succeeding frost corrects the bad effects of such ploughing; a succeeding drought increases them.

138
Culture of oats.

The common method is, to sow oats on new-ploughed land in the month of March, as soon as the ground is tolerably dry. If it continues wet all the month of March, it is too late to venture them after. It is much

better to summer-fallow, and to sow wheat in the autumn. But the preferable method, especially in clay-soil, is to turn over the field after harvest, and to lay it open to the influences of frost and air, which lessen the tenacity of clay, and reduce it to a free mould. The surface-soil by this means is finely mellowed for reception of the seed; and it would be a pity to bury it by a second ploughing before sowing. In general, the bulk of clay-soils are rich; and skilful ploughing without dung, will probably give a better crop, than unskilful ploughing with dung.

Hitherto of natural clays. We must add a word of carse-clays which are artificial, whether left by the sea, or swept down from higher grounds by rain. The method commonly used of dressing carse-clay for oats, is, not to stir it till the ground be dry in the spring, which seldom happens before the first of March, and the seed is sown as soon after as the ground is sufficiently dry for its reception. Frost has a stronger effect on such clays than on natural clay. And if the field be laid open before winter, it is rendered so loose by frost as to be soon drenched in water. The particles at the same time are so small, as that the first drought in spring makes the surface cake or crust. The difficulty of reducing this crust into mould for covering the oat-seed, has led farmers to delay ploughing till the month of March. But we are taught by experience, that this soil ploughed before winter, is sooner dry than when the ploughing is delayed till spring; and as early sowing is a great advantage, the objection of the superficial crusting is easily removed by the first harrow above described, which will produce abundance of mould for covering the seed. The ploughing before winter not only procures early sowing, but has another advantage: the surface-soil that had been mellowed during winter by the sun, frost, and wind, is kept above.

The dressing a loamy soil for oats differs little from dressing a clay soil, except in the following particular, that being less hurt by rain, it requires not high ridges, and therefore ought to be ploughed crown and furrow alternately.

Where there is both clay and loam in a farm, it is obvious from what is said above, that the ploughing of the clay after harvest ought first to be dispatched. If both cannot be overtaken that season, the loam may be delayed till the spring with less hurt.

Next of a gravelly soil; which is the reverse of clay, as it never suffers but from want of moisture. Such a soil ought to have no ridges; but be ploughed circularly from the centre to the circumference, or from the circumference to the centre. It ought to be tilled after harvest: and the first dry weather in spring ought to be laid hold of to sow, harrow, and roll; which will preserve it in sap.

The culture of oats is the simplest of all. That grain is probably a native of Britain: it will grow on the worst soil with very little preparation. For that reason, before turnip was introduced, it was always the first crop upon land broken up from the state of nature.

Upon such land, may it not be a good method, to build upon the crown of every ridge, in the form of a wall, all the surface-earth, one sod above another, as in a fold for sheep? After standing in this form all the summer and winter, let the walls be thrown down, and the ground prepared for oats. This will

secure.

Practice. secure one or two good crops; after which the land may be dunged for a crop of barley and grass-seeds. This method may answer in a farm where manure is scarce.

3. BARLEY.

139
Culture of
barley.

THIS is a culmiferous plant that requires a mellow soil. Upon that account, extraordinary care is requisite where it is to be sown in clay. The land ought to be stirred immediately after the foregoing crop is removed, which lays it open to be mellowed with the frost and air. In that view, a peculiar sort of ploughing has been introduced, termed *ribbing*; by which the greatest quantity of surface possible is exposed to the air and frost. The obvious objection to this method is, that half of the ridge is left unmoved. And to obviate that objection, the following method is offered, which moves the whole soil, and at the same time exposes the same quantity of surface to the frost and air.

141
A better
method.

As soon as the former crop is off the field, let the ridges be gathered with as deep a furrow as the soil will admit, beginning at the crown and ending at the furrows. This ploughing loosens the whole soil, giving free access to the air and frost. Soon after, begin a second ploughing in the following manner. Let the field be divided by parallel lines cross the ridges, with intervals of 30 feet or so. Plough once round an interval, beginning at the edges, and turning the earth toward the middle of the interval; which covers a foot or so of the ground formerly ploughed. Within that foot plough another round similar to the former; and after that, other rounds, till the whole interval be finished, ending at the middle. Instead of beginning at the edges, and ploughing toward the middle, it will have the same effect to begin at the middle and to plough toward the edges. Plough the other intervals in the same manner. As by this operation the furrows of the ridges will be pretty much filled up, let them be cleared and water-furrowed without delay. By this method, the field will be left waving like a plot in a kitchen-garden, ridged up for winter. In this form, the field is kept perfectly dry; for beside the capital furrows that separate the ridges, every ridge has a number of cross furrows that carry the rain instantly to the capital furrows. In hanging grounds retentive of moisture, the parallel lines above mentioned ought not to be perpendicular to the furrows of the ridges, but to be directed a little downward, in order to carry rain-water the more hastily to these furrows. If the ground be clean, it may lie in that state winter and spring, till the time of seed-furrowing. If weeds happen to rise, they must be destroyed by ploughing, or brakeing, or both; for there cannot be worse husbandry, than to put seed into dirty ground.

142
Advantages of this
method.

This method resembles common ribbing in appearance, but is very different in reality. As the common ribbing is not preceded by a gathering furrow, the half of the field is left untilled, compact as when the former crop was removed, impervious in a great measure to air or frost. The common ribbing at the same time lodges the rain-water on every ridge, preventing it from descending to the furrows; which is hurtful in all soils, and poisonous in a clay soil. The *stitching* here described, or *ribbing*, if you please to call it so,

prevents these noxious effects. By the two ploughings the whole soil is opened, admitting freely air and frost; and the multitude of furrows lays the surface perfectly dry, giving an early opportunity for the barley-seed. But further, as to the advantage of this method: When it is proper to sow the seed, all is laid flat with the brake, which is an easy operation upon soil that is dry and pulverized; and the seed-furrow which succeeds, is so shallow as to bury little or none of the surface-earth: whereas the stirring for barley is commonly done with the deepest furrow; and consequently buries all the surface-soil that was mellowed by the frost and air. Nor is this method more expensive; because the common ribbing must always be followed with a dry season. stirring furrow, which is saved in the method recommended. Nay, it is less expensive; for after common ribbing, which keeps in the rain water, the ground is commonly so soured, as to make the stirring a laborious work.

It is well known that barley is less valuable when it does not ripen equally; and that barley which comes up speedily in a dusky soil, must gain a great advantage over seed-weeds. Therefore, first take out about one-third of the contents of the sacks of seed barley or bear, to allow for the swelling of the grain. Lay the sacks with the grain to steep in clean water; let it lie covered with it for at least 24 hours. When the ground is so dry as at present, and no likelihood of rain for 10 days, it is better to lie 36 hours. Sow the grain wet from steeping, without any addition of powdered quick-lime, which, though often recommended in print, can only poison the seed, suck up part of its useful moisture, and burn the hands of the sower. The seed will scatter well, as clean water has no tenacity; only the sower must put in a fourth or a third more seed in bulk than usual of dry grain, as the grain is swelled in that proportion: harrow it in as quickly as possible after it is sown: and though not necessary, give it the benefit of fresh furrow, if convenient. You may expect it up in a fortnight at farthest.

The following experiment by a correspondent of the Bath Society being considered as a very interesting one, is here subjoined.

144
“The last spring (1783) being remarkably dry, I soaked my seed-barley in the black water taken from a reservoir which constantly receives the draining of my dung-heap and stables. As the light corn floated on the top, I skimmed it off, and let the rest stand 24 hours. On taking it from the water, I mixed the seed grain with a sufficient quantity of sifted wood-ashes, to make it spread regularly, and sowed three fields with it. I began sowing the 16th, and finished the 23d of April. The produce was 60 bushels per acre, of good clean barley, without any *small* or *green* corn, or weeds at harvest. No person in this country had better grain.”

I sowed also several other fields with the same seed dry, and without any preparation; but the crop, like those of my neighbours, was very poor; not more than twenty bushels per acre, and much mixed with *green* corn and weeds when harvested. I also sowed some of the seed dry on one ridge in each of my former fields, but the produce was very poor in comparison of the other parts of the field.”

Where the land is in good order, and free of weeds, April

Practice.

143
Management of
seed in a
dry season.

144
Important
experiments on
seed-barley.

Practice.

145
Time of
sowing.

April is the month for sowing barley. Every day is proper, from the first to the last.

The dressing loamy soil and light soil for barley, is the same with that described; only that to plough dry is not altogether so essential as in dressing clay-soil. Loam or sand may be stirred a little moist: better, however, delay a week or two, than to stir a loam when moist. Clay must never be ploughed moist, even tho' the season should escape altogether. But this will seldom be necessary; for not in one year of 20 will it happen, but that clay is dry enough for ploughing some time in May. Frost may correct clay ploughed wet after harvest; but ploughed wet in the spring, it unites into a hard mass, not to be dissolved but by very hard labour.

On the cultivation of this grain we have the following observations by a Norfolk farmer.

146

Miscellaneous observations concerning the cultivation of barley.

The best soil, he observes, is that which is dry and healthy, rather light than stiff, but yet of sufficient tenacity and strength to retain the moisture. On this kind of land the grain is always the best bodied and coloured, the nimblest in the hand, and has the thinnest rind. These are qualities which recommend it most to the maltster. If the land is poor, it should be dry and warm; and when so, it will often bear better corn than richer land in a cold and wet situation.

In the choice of your seed, it is needful to observe, that the best is of a pale lively colour, and brightish cast, without any deep redness or black tinge at the tail. If the rind be a little shrivelled, it is the better; for that slight shrivelling proves it to have a thin skin, and to have sweated in the mow. The necessity of a change of seed by not sowing two years together what grew on the same soil, is not in any part of husbandry more evident than in the culture of this grain, which, if not frequently changed, will grow coarser and coarser every succeeding year.

It has generally been thought that feed-barley would be benefited by steeping; but liming it has, in many instances, been found prejudicial. Sprinkling a little foot with the water in which it is steeped has been of great service, as it will secure the seed from insects. In a very dry seed-time, barley that has been wetted for malting, and begins to sprout, will come up sooner, and produce as good a crop as any other.

If you sow after a fallow, plough three times at least. At the first ploughing, lay your land up in small ridges, and let it remain so during the winter, for the frost to mellow it; the second ploughing should be the beginning of February. In march split the ridges, and lay the land as flat as possible, at the same time harrowing it fine. But in strong wet lands (if you have no other for barley) lay it round, and make deep furrows to receive the water.

"I have often (continues he), taken the following method with success; On lands tolerably manured, I sowed clover with my barley, which I reaped at harvest; and fed the clover all the following winter, and from spring to July, when I fallowed it till the following spring, and then sowed it with barley and clover as before. Repeating this method every year, I had very large crops, but would not recommend this practice on poor light land.

"We sow on our lightest lands in April, on our moist lands in May; finding that those lands which are

the most subject to weeds produce the best crops when sown late.

Practice.

"The common method is to sow the barley-feed broad-cast at two sowings; the first harrowed in once, the second twice; the usual allowance from three to four bushels per acre. But if farmers could be prevailed on to alter this practice, they would soon find their account in it. Were only half the quantity sown equally, the produce would be greater, and the corn less liable to lodge: For when corn stands very close, the stalks are drawn up weak; and on that account are less capable of resisting the force of winds, or supporting themselves under heavy rains.

"From our great success in setting and drilling wheat, some of our farmers tried these methods with barley; but did not find it answer their expectations, except on very rich land.

"I have myself had 80 stalks on one root of barley, which all produced good and long ears, and the grain was better than any other; but the method is too expensive for general practice. In poor land, sow thin, or your crop will be worth little. Farmers who do not reason on the matter, will be of a different opinion; but the fact is indisputable."

When the barley is sowed and harrowed in, he advises that the land be rolled after the first shower of rain, to break the clods. This will close the earth about the roots, which will be a great advantage to it in dry weather.

When the barley has been up three weeks or a month, it is a very good way to roll it again with a heavy roller, which will prevent the sun and air from penetrating the ground to the injury of the roots. This rolling, before it branches out, will also cause it to tiller into a greater number of stalks; so that if the plants be thin, the ground will be thereby filled, and the stalks strengthened.

If the blade grows too rank, as it sometimes will in a warm wet spring, mowing is a much better method than feeding it down with sheep; because the scythe takes off only the rank tops, but the sheep being fond of the sweet end of the stalk next the root, will often bite so close as to injure its future growth.

4. BUCK-WHEAT.

THE uses of this plant have been mentioned in the preceding part, n° 46. It delights in a mellow sandy soil; but succeeds well in any dry loose healthy land, and moderately so in a free loamy stone-brash. A stiff clay is its aversion, and it is entirely labour lost to sow it in wet poachy ground. The proper season for sowing is from the last week of May or the beginning of June. It has been sown, however, so early as the beginning of April, and so late as the 22d of July, by way of experiment; but the latter was rather extreme to be chosen, and the former was in danger from frost. In an experiment upon a small piece of ground, the grain of two different crops was brought to maturity in the summer 1787.—After spring feedings, a crop of turnip-rooted cabbage, or vetches, there will be sufficient time to sow the land with buck-wheat. Probably, in hot dry summers, a crop of vetches might even be mown for hay early enough to introduce a crop of this grain after it.

In the year 1780, about seven acres of a sandy soil

on

147
Culture of
Buck-
wheat.

Practice. on Brisslington Common (A), having been first tolerably well cleansed from brambles, furze, &c. received one ploughing. To reduce the irregularities of the surface, it was rolled; and on the 9th of June in that year, two bushels and a half of buck-wheat per acre sown, the ground rolled again without harrowing.

148
Advantages of this cropping

The vegetation appeared in five or six days, as is constantly the case be the weather wet or dry. The growth was so rapid, that the fern, with which this land greatly abounded, was completely kept under. About the middle of September the crop was mown, but by reason of a great deal of rain about that time, it was not secured until the beginning of October; hence a loss of great part of the grain by shedding, as well as some eaten by birds. However, there were saved about 24 Winchester bushels per acre; and, notwithstanding its long exposure to the weather, received no sort of damage, only perhaps that the finest and most perfect grain was the first to fall from the plant. The ground after this had almost the appearance of a fallow, and was immediately ploughed.

When it had lain a moderate time to meliorate, and to receive the influences of the atmosphere, it was harrowed, sown with Lammas wheat, and ploughed in under furrow, in a contrary direction to the first ploughing. Thus a piece of land, which in the month of April was altogether in a state of nature, in the following November was seen under a promising crop of what is well styled the king of grain, and this without the aid of manure, or of any very great degree of tillage. Nor was the harvest by any means deficient; for several persons conversant in such things estimated the produce from 26 to 30 bushels per acre. As soon as the wheat crop was taken off, the ground had one ploughing, and on the first of September following was sown with turnip-seed. The turnips were not large, but of an herbage so abundant as in the following spring to support 120 ewes with their lambs, which were fed on it by folding four weeks. After this it was manured with a composition of rotten dung and natural earth, about 20 putt loads per acre, and planted with potatoes. The crop sold for L. 138, besides a considerable number used in the family, and a quantity reserved with which ten acres were planted the following season. The ensuing autumn it was again sown with wheat, and produced an excellent crop. In the spring of 1784, it was manured and planted with potatoes, as in the preceding instance; the crop (tho' tolerably good) by no means equal to the former, producing about 100 sacks per acre only. In spring 1785, the land was now for a third time under a crop of wheat, it being intended to try how far this mode of alternate cropping, one year with potatoes and another with wheat, may be carried.

From the success of the preceding and other experiments, by Nehemiah Bartley, Esq; of Bristol, as detailed in the Bath Society Papers, it would seem, that the culture of this plant ought in many cases to be adopted instead of a summer-fallowing: for the crop produced appears not only to be so much clear gain in respect to such practice, but also affords a considerable quantity of straw for fodder and manure; beside that

a summer-fallowing is far from being so advantageous a preparation for a succeeding crop. **Practice.**

5. BEANS.

THE properest soil for beans is a deep and moist clay. There was lately introduced into Scotland a method

149
Culture of beans.

of sowing beans with a drill-plough, and horse-hoeing the intervals; which, beside affording a good crop, is a dressing to the ground. But as that method is far from being general, we keep in the common track.

As this grain is early sown, the ground intended for it should be ploughed before winter, to give access to the frost and air; beneficial in all soils, and necessary in a clay soil. Take the first opportunity after January when the ground is dry, to loosen the soil with the harrow first described, till a mould be brought upon it. Sow the seed, and cover it with the second harrow. The third will smooth the surface, and cover the seed equally. These harrows make the very best figure in sowing beans; which ought to be laid deep in the ground, not less than six inches. In clay soil, the common harrows are altogether insufficient. The soil, which has rested long after ploughing, is rendered compact and solid: the common harrows skim the surface: the seed is not covered; and the first hearty shower of rain lays it above ground. Where the farmer overtakes not the ploughing after harvest, and is reduced to plough immediately before sowing, the plough answers the purpose of the first harrow; and the other two will complete the work. But the labour of the first harrow is ill saved; as the ploughing before winter is a fine preparation, not only for beans, but for grain of every kind. If the ground ploughed before winter happen by superfluity of moisture to cake, the first harrow going along the ridges, and crossing them, will loosen the surface, and give access to the air for drying. As soon as the ground is dry, sow without delaying a moment. If rain happen in the interim, there is no remedy but patience till a dry day or two come.

Carse-clay, ploughed before winter, seldom fails to cake. Upon that account, a second ploughing is necessary before sowing; which ought to be performed with an ebb furrow, in order to keep the frost-mould as near the surface as possible. To cover the seed with the plow is expressed by the phrase *to sow under furrow*. The clods raised in this ploughing are a sort of shelter to the young plants in the chilly spring-months.

The foregoing method will answer for loam. And as for a sandy or gravelly soil, it is altogether improper for beans.

Though we cannot approve the horse-hoeing of beans, with the intervals that are commonly allotted for turnip, yet we would strongly recommend the drilling them at the distance of 10 or 12 inches, and keeping the intervals clean of weeds. This may be done by hand-hoeing, taking opportunity at the same time to lay fresh soil to the roots of the plants. But as this is an expensive operation, and hands are not always to be got, a narrow plough, drawn by a single horse, might be used, with a mould-board on each side to scatter the earth.

(A) A very rough piece of land, at that time just inclosed.

Practice.

earth upon the roots of the plants. This is a cheap and expeditious method: it keeps the ground clean; and nourishes the plants with fresh soil.

As beans delight in a moist soil, and have no end of growing in a moist season, they cover the ground totally when sown broadcast, keep in the dew, and exclude the sun and air: the plants grow to a great height; but carry little seed, and that little not well ripened. This displays the advantage of drilling; which gives free access to the sun and air, dries the ground, and affords plenty of ripe seed.

6. P E A S E.

150
Culture of
pease.

PEASE are of two kinds; the white and the gray. The cultivation of the latter only belongs to this place.

There are two species of the gray kind, distinguished by their time of ripening. One ripens soon, and for that reason is termed *hot seed*: the other, which is slower in ripening, is termed *cold seed*.

Pease, a leguminous crop, is proper to intervene between two culmiferous crops; less for the profit of a pease-crop, than for meliorating the ground. Pease, however, in a dry season, will produce six or seven bolls each acre; but, in an ordinary season, they seldom reach above two, or two and a half. Hence, in a moist climate, which all the west of Britain is, red clover seems a more beneficial crop than pease; as it makes as good winter-food as pease, and can be cut green thrice during summer.

A field intended for cold seed ought to be ploughed in October or November; and in February, as soon as the ground is dry, the seed ought to be sown on the winter-furrow. A field intended for hot seed ought to be ploughed in March or April, immediately before sowing. But if infested with weeds, it ought to be also ploughed in October or November.

Pease laid a foot below the surface will vegetate; but the most approved depth is six inches in light soil, and four inches in clay soil; for which reason, they ought to be sown under furrow when the ploughing is delayed till spring. Of all grain, beans excepted, they are the least in danger of being buried.

Pease differ from beans, in loving a dry soil and a dry season. Horse-hoeing would be a great benefit, could it be performed to any advantage; but pease grow expeditiously, and soon fall over and cover the ground, which bars ploughing. Horse-hoeing has little effect when the plants are new sprung; and when they are advanced to be benefited by that culture, their length prevents it. Fast growing at the same time is the cause of their carrying so little seed: the seed is buried among the leaves; and the sun cannot penetrate to make it grow and ripen. The only practicable remedy to obtain grain, is thin sowing; but thick sowing produces more straw, and mellows the ground more. Half a boll for an English acre may be reckoned thin sowing; three firlots, thick sowing.

Notwithstanding what is said above, Mr Hunter, a noted farmer in Berwickshire, began some time ago to sow all his pease in drills; and never failed to have great crops of corn as well as of straw. He sowed double rows at a foot interval, and two feet and an half between the double rows, which admit horse-hoeing. By that method, he had also good crops of beans on light land.

N^o 8.

Practice.

Pease and beans mixed are often sown together, in order to catch different seasons. In a moist season, the beans make a good crop; in a dry season, the pease.

The growth of plants is commonly checked by drought in the month of July; but promoted by rain in August. In July, grass is parched; in August, it recovers verdure. Where pease are so far advanced in the dry season as that the seed begins to form, their growth is indeed checked, but the seed continues to fill. If only in the blossom at that season, their growth is checked a little; but they become vigorous again in August, and continue growing without filling till stopped by frost. Hence it is, that cold seed, which is early sown, has the best chance to produce corn: hot seed, which is late sown, has the best chance to produce straw.

The following method is practised in Norfolk, for sowing pease upon a dry light soil, immediately opened from pasture. The ground is pared with a plough extremely thin, and every sod is laid exactly on its back. In every sod a double row of holes is made. A pea dropt in every hole lodges in the flay'd ground immediately below the sod, thrusts its roots horizontally, and has sufficient moisture. This method enabled Norfolk farmers, in the barren year 1740, to furnish white pease at 12s. per boll.

II. Plants cultivated for Roots. [See also Art. III.]

1. T U R N I P.

TURNIP delights in a gravelly soil; and there it can be raised to the greatest perfection, and with the least hazard of miscarrying. At the same time, there is no soil but will bear turnip when well prepared.

No person ever deserved better of a country, than he who first cultivated turnip in the field. No plant is better fitted for the climate of Britain, no plant prospers better in the coldest part of it, and no plant contributes more to fertility. In a word, there has not for two centuries been introduced into Britain a more valuable improvement.

Of all roots, turnip requires the finest mould; and to that end, of all harrows frost is the best. In order to give access to frost, the land ought to be prepared by ribbing after harvest, as above directed in preparing land for barley. If the field be not subject to annuals, it may lie in that state till the end of May; otherwise the weeds must be destroyed by a brakeing about the middle of April; and again in May, if weeds rise. The first week of June, plough the field with a shallow furrow. Lime it if requisite, and harrow the lime into the soil. Draw single furrows with intervals of three feet, and lay dung in the furrows. Cover the dung sufficiently, by going round it with the plough, and forming the three-feet spaces into ridges. The dung comes thus to lie below the crown of every ridge.

The season of sowing must be regulated by the time intended for feeding. Where intended for feeding in November, December, January, and February, the seed ought to be sown from the 1st to the 20th of June. Where the feeding is intended to be carried on to March, April, and May, the seed must not be sown till the end of July. Turnip sown earlier than above directed, flowers that very summer, and runs fast to seed; which renders it in a good measure unfit for food.

Practice. food. If sown much later, it does not apple, and there is no food but from the leaves.

Though by a drill-plough the seed may be sown of any thickness, the safest way is to sow thick. Thin sowing is liable to many accidents, which are far from being counterbalanced by the expence that is saved in thinning. Thick sowing can bear the ravage of the black fly, and leave a sufficient crop behind. It is a protection against drought, gives the plants a rapid progress, and establishes them in the ground before it is necessary to thin them.

The sowing turnip broadcast is universal in England, and common in Scotland, though a barbarous practice. The eminent advantage of turnip is, that beside a profitable crop, it makes a most complete fallow; and the latter cannot be obtained but by horse-hoeing. Upon that account, the sowing turnip in rows at three feet distance is recommended. Wider rows answer no profitable end, straiter rows afford not room for a horse to walk in. When the turnip is about four inches high, annual weeds will appear. Go round every interval with the slightest furrow possible, at the distance of two inches from each row, moving the earth from the rows toward the middle of the interval. A thin plate of iron must be fixed on the left side of the plough, to prevent the earth from falling back and burying the turnip. Next, let women be employed to weed the rows with their fingers; which is better, and cheaper done, than with the hand-hoe. The hand-hoe, beside, is apt to disturb the roots of the turnip that are to stand, and to leave them open to drought by removing the earth from them. The standing turnip are to be at the distance of twelve inches from each other: a greater distance makes them swell too much; a less distance affords them not sufficient room. A woman soon comes to be expert in finger-weeding. The following hint may be necessary to a learner. To secure the turnip that is to stand, let her cover it with the left hand; and with the right pull up the turnip on both sides. After thus freeing the standing turnip, she may safely use both hands. Let the field remain in this state till the appearance of new annuals make a second ploughing necessary; which must be in the same furrow with the former, but a little deeper. As in this ploughing the iron plate is to be removed, part of the loose earth will fall back on the roots of the plants: the rest will fill the middle of the interval, and bury every weed. When weeds begin again to appear, then is the time for a third ploughing in an opposite direction, which lays the earth to the roots of the plants. This ploughing may be about the middle of August; after which, weeds rise very faintly. If they do rise, another ploughing will clear the ground of them. Weeds that at this time rise in the row, may be cleared with a hand-hoe, which can do little mischief among plants distant twelve inches from each other. It is certain, however, that it may be done cheaper with the hand (A). And after the leaves of turnips in a row meet

Vol. I. Part I.

together, the hand is the only instrument that can be applied for weeding.

In swampy ground, the surface of which is best reduced by paring and burning, the seed may be sown in rows with intervals of a foot. To save time, a drill-plough may be used that sows three or four rows at once. Hand-hoeing is proper for such ground; because the soil under the burnt *stratum* is commonly full of roots, which digest and rot better under ground than when brought to the surface by the plough. In the mean time, while these are digesting, the ashes will secure a good crop.

In cultivating turnips to advantage, great care should be taken to procure good, bright, nimble, and well-dried seed, and of the best kinds.

The Norfolk farmers generally raise the oval white, the large green-topp'd, and the red or purple-topp'd kinds, which from long experience they have found to be the most profitable.

The roots of the green-topp'd will grow to a large size, and continue good much longer than others. The red or purple-topp'd will also grow large, and continue good to the beginning of February; but the roots become hard and stringy sooner than the former.

The green-topp'd growing more above ground, is in more danger of sustaining injury from severe frosts than the red or purple, which are more than half covered by the soil; but it is the softest and sweetest, when grown large, of any kind. We have seen them brought to table a foot in diameter, and equally good as garden turnips.

Turnips delight in a light soil, consisting of sand and loam mixed; for when the soil is rich and heavy, although the crop may be as great in weight, they will be rank, and run to flower earlier in spring.

Turnip-seed, like that of grain, will not do well without frequent changing. The Norfolk seed is sent to most parts of the kingdom, and even to Ireland, but after two years it degenerates; so that those who wish to have turnips in perfection should procure it fresh every year from Norwich, and they will find their account in so doing. For from its known reputation, many of the London seedsmen sell, under that character, seed raised in the vicinity of the metropolis, which is much inferior in quality.

When the plants have got five leaves, they should be hoed, and set out at least six inches apart. A month afterward, or earlier if it be a wet season, a second hoeing should take place, and the plants be left at least 14 inches distant from each other, especially if intended for feeding cattle; for where the plants are left thicker, they will be proportionably smaller, unless the land is very rich indeed.

Some of the best Norfolk farmers sow turnips in drills three feet asunder, and at a second hoeing leave them a foot apart in the rows. By this means the trouble and expence of hoeing is much lessened, and the crop of equal weight as when sown in the common

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(A) Children under thirteen may be employed to weed turnip with the fingers. We have seen them go on in that work with alacrity; and a small premium will have a good effect. For boys and girls above thirteen, a hand-hoe adapted to their size is an excellent instrument: it strengthens the arms amazingly. In driving the plough, the legs only are exercised; but as the arms are chiefly employed in husbandry, they ought to be prepared beforehand by gentle exercise.

Practice.

153
Properties
of different
sorts of tur-
nip.

154
Observa-
tions with
regard to
seed.

155
Methods of
culture in
Norfolk.

Practice. mon method. The intervals may easily be cleared of weeds by the horse-hoe.

156
Value as
food for
cattle.

Great quantities of turnips are raised in Norfolk every year for feeding black cattle, which turn to great advantage.

It is well known, that an acre of land contains 4840 square yards, or 43,560 square feet; suppose then that every square foot contains one turnip, and that they weigh only two pounds each on an average, here will be a mass of food, excellent in kind, of 46 tons per acre, often worth from four to five guineas, and sometimes more.

Extraordinary crops of barley frequently succeed turnips, especially when fed off the land. In feeding them off, the cattle should not be suffered to run over too much of the ground at once, for in that case they will tread down and spoil twice as many as they eat. In Norfolk, they are confined by herds to as much as is sufficient for them for one day. By this mode the crop is eaten clean, the soil is equally trodden, which if light is of much service, and equally manured by the cattle.

A notion prevails in many places, that mutton fattened with turnips is thereby rendered rank and ill-tasted; but this is a vulgar error. The best mutton in Norfolk (and few counties have better) is all fed with turnips. It is rank pastures, and marshy lands, that produce rank mutton.

If the land be wet and springy, the best method is to draw and carry off your turnips to some dry pasture; for the trading of the cattle will not only injure the crop, but render the land so stiff, that you must be at an additional expence in ploughing.

157
Method of
preserving
turnips.

To preserve turnips for late spring feed, the best method, and which has been tried with success by some of the best English farmers is, To stack them up in dry straw; a load of which is sufficient to preserve the 40 tons of turnips. The method is easy, and as follows:—

After drawing your turnips in February, cut off the tops and tap roots (which may be given to sheep), and let them lie a few days in the field, as no weather will then hurt them.

Then, on a layer of straw next the ground, place a layer of turnips two feet thick; and then another layer of straw, and so on alternately, till you have brought the heap to a point. Care must be taken to turn up the edges of the layers of straw, to prevent the turnips from rolling out; cover the top well with long straw, and it will serve as a thatch for the whole.

In this method, as the straw imbibes the moisture exhaled from the roots, all vegetation will be prevented, and the turnips will be nearly as good in May as when first drawn from the field. If straw be scarce, old haulm or stubble will answer the same purpose.

But to prevent this trouble and expence, perhaps farmers in all counties would find it most to their interest to adopt the method used by our neighbours the Norfolk farmers, which is, to continue sowing turnips to the latter end of August; by which means their late crops remain good in the field till the latter end of April, and often till the middle of May.

The advantages of having turnips good till the spring feed is generally ready, are so obvious and so great, that many of the most intelligent farmers (although at

first prejudiced against the practice) are now come into it, and find their account in so doing. Practice.

2. POTATOES.

158

THE choice of soil is not of greater importance in any other plant than in a potato. This plant in clay soil, or in rank black loam lying low without ventilation, never makes palatable food. In a gravelly or sandy soil, exposed to the sun and to free air, it thrives to perfection, and has a good relish. But a rank black loam, though improper to raise potatoes for the table, produces them in great plenty; and the product is, as already observed, a palatable food for horned cattle, hogs, and poultry.

The spade is a proper instrument for raising a small quantity, or for preparing corners or other places inaccessible to the plough; but for raising potatoes in quantities, the plough is the only instrument.

As two great advantages of a drilled crop are, to destroy weeds, and to have a fallow at the same time with the crop, no judicious farmer will think of raising potatoes in any other way. In September or October, as soon as that year's crop is removed, let the field have a rousing furrow, a cross-brakeing next, and then be cleared of weeds by the cleaning harrow. Form it into three-foot ridges, in that state to lie till April, which is the proper time for planting potatoes. Cross-brake it, to raise the furrows a little. Then lay well-digested horse-dung along the furrows, upon which lay the roots at eight inches distance. Cover up these roots with the plough, going once round every row. This makes a warm bed for the potatoes; hot dung below, and a loose covering above, that admits every ray of the sun. As soon as the plants appear above ground, go round every row a second time with the plough, which will lay upon the plants an additional inch or two of mould, and at the same time bury all the annuals; and this will complete the ploughing of the ridges. When the potatoes are six inches high, the plough, with the deepest furrow, must go twice along the middle of each interval in opposite directions, laying earth first to one row, and next to the other. And to perform this work, a plough with a double mould-board will be more expeditious. But as the earth cannot be laid close to the roots by the plough, the spade must succeed, with which four inches of the plants must be covered, leaving little more but the tops above ground; and this operation will at the same time bury all the weeds that have sprung since the former ploughing. What weeds arise after must be pulled up with the hand. A hoe is never to be used here: it cannot go so deep as to destroy the weeds without cutting the fibres of the plants; and if it skim the surface, it only cuts off the heads of the weeds, and does not prevent their pushing again.

In the Bath Society Papers, we have the following practical observations on the culture and use of potatoes, given as the result of various experiments made for five years successively on that valuable root, the growth of which cannot be too much encouraged. Particular methods.

When the potato crop has been the only object in view, the following method is the most eligible.

The land being well pulverized by two or three good harrowings and ploughings, is then manured with 15 or 20 cart-loads of dung per acre, before it receives its last

Practice. last earth. Then it is thrown on to what the Suffolk farmers call the *Trench balk*, which is narrow and deep ridge-work, about 15 inches from the centre of one ridge to the centre of the other. Women and children drop the sets in the bottom of every furrow 15 inches apart; men follow and cover them with large hoes, a foot in width, pulling the mould down so as to bury the sets five inches deep; they must receive two or three hand-hoeings, and be kept free from weeds; always observing to draw the earth as much as possible to the stems of the young plants. By repeated trials, the first or second week in April is found the most advantageous time for planting.

In the end of September or the beginning of October, when the haulm becomes withered, they should be ploughed up with a strong double-breasted plough. The workman must be cautioned to set his plough very deep, that he may strike below all the potatoes, to avoid damaging the crop. The women who pick them up, if not carefully attended to, will leave many in the ground, which will prove detrimental to any succeeding corn, whether wheat or barley. To avoid which inconvenience, let the land be harrowed, and turn the swine in to glean the few that may be left by their negligence.

By this method, the sets will be 15 square inches from each other; it will take 18 bushels to plant an acre; and the produce, if on a good mixed loamy soil, will amount to 300 bushels.

If the potatoes are grown as a preparation for wheat, it is preferable to have the rows two feet two inches from each other, hand-hoeing only the space from plant to plant in each row; then turning a small furrow from the inside of each row by a common light plough, and afterwards with a double-breasted plough with one horse, split the ridge formed by the first ploughing thoroughly to clean the intervals. This work should not be done too deep the first time, to avoid burying the tender plants; but the last earth should be ploughed as deep as possible; and the closer the mould is thrown to the stems of the plants, the more advantageous it will prove. Thus 15 bushels will plant an acre, and the produce will be about 300 bushels; but the land, by the summer ploughings, will be prepared to receive seed-wheat immediately, and almost ensure a plentiful crop.

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To prevent the grub. The potato-sets should be cut a week before planting, with one or two eyes to each, and the pieces not very small; two bushels of fresh slaked lime should be sown over the surface of the land as soon as planted, which will effectually prevent the attacks of the grub.

The expence attending an acre of potatoes well cultivated in the first method, supposing the rent 20 shillings, tithe and town charges rather high (as in Suffolk), taking up, and every thing included, will be about six pounds. In the last method, it would be somewhat reduced.

“When predilections for old customs are subdued (adds the author), I hope to see the potato admitted in the constant course of crops by every spirited husbandman. The most beneficial effects will, I am certain, accrue from such a system. The advantages in my neighbourhood are apparent; I cultivated and fed my own children upon them, and my poorer neighbours sensibly followed the example. A great proportion of

every cottager's garden is now occupied by this root, and it forms a principal part of their diet. Potatoes are cheap and excellent substitutes for pease in soups and broths, allowing double the quantity.

“Although it is nearly a transcript of the directions given by a very ingenious author, yet I shall take the liberty of inserting a receipt for making a potato-soup, which I have weekly distributed amongst the poor to their great relief.

Practice.

¹⁶¹
A cheap preparation for the poor.

	s.	d.
An ox's head	2	9
Two pecks of potatoes	0	6
Quarter of a peck of onions	0	3
Three quarters of a pound of salt	0	1
An ounce and a half of pepper	0	3

Total 3 10

Ninety pints of water to be boiled with the above ingredients on a slow fire until reduced to 60, which require one peck of coals, value threepence. I have added the expence of every article according to their prices with me, that gentlemen may nearly perceive at how easy a rate they can feed 60 of their poor neighbours. I find from experience, a pint of this soup, with a small piece of the meat, is sufficient to satisfy a hearty working man with a good meal. If vegetables are plentiful, some of every sort may be added, with a few sweet herbs.

“I hope my inserting the above, will not be esteemed improper; though somewhat deviating from the culture of potatoes, it may possibly be a means of rendering them more extensively useful.”

A premium having been offered by the abovementioned Society for the cultivation of potatoes by farmers, &c. whose rent does not exceed 40l. per annum, the following methods were communicated, by which those who have only a small spot of ground may obtain a plentiful crop.

First, then, the earth should be dug 12 inches deep, if the soil will allow of it; after this, a hole should be opened about six inches deep, horse-dung, or long litter should be put therein about three inches thick; this hole should not be more than 12 inches in diameter; upon this dung or litter, a potato should be planted whole, upon which a little more dung should be shook, and then earth must be put thereon. In like manner the whole plot of ground must be planted, taking care that each potato be at least 16 inches apart; and when the young shoots make their appearance, they should have fresh mould drawn round them with a hoe; and if the tender shoots are covered, it will prevent the frost from injuring them: they should again be earthed when the shoots make a second appearance, but not be covered, as in all probability the season will then be less severe. A plentiful supply of mould should be given them, and the person who performs this business should never tread upon the plant, or the hillock that is raised round it; as the lighter the earth is, the more room the potato will have to expand. From a single root thus planted, very near 40 pounds weight of large potatoes were obtained, and from almost every other root upon the same plot of ground from 15 to 20 pounds weight; and except the soil be stoney or gravelly, 10 pounds or half a peck of potatoes may almost always be obtained from each root, by pursuing

¹⁶²
Methods of cultivating potatoes on small spots

Practice. the foregoing method. But note, cuttings or small sets will not do for this purpose.

163
Methods
of culture
adapted to
small farms.

The second method will suit the indolent, or those who have not time to dig their ground, and that is, where weeds much abound and have not been cleared in the winter, a trench may be opened in a straight line the whole length of the ground, and about six inches deep; in this trench the potatoes should be planted about 10 inches apart; cuttings or small potatoes will do for this method. When they are laid in the trench, the weeds that are on the surface may be pared off on each side about 10 inches from it, and be turned upon the plants; another trench should then be dug, and the mould that comes out of it turned carefully on the weeds. It must not be forgot, that each trench should be regularly dug, that the potatoes may be throughout the plot 10 or 12 inches from each other. This slovenly method will in general raise more potatoes than can be produced by digging the ground twice, and dibbling in the plants; and the reason is, that the weeds lighten the soil, and give the roots room to expand. They should be twice hoed, and earthed up in rows. And here note, that if cut potatoes are to be planted, every cutting should have two eyes, for though fewer sets will be obtained, there will be a greater certainty of a crop, as one eye often fails or is destroyed by grubs in the earth.

Where a crop of potatoes fail in part (as will sometimes be the case in a dry season), amends may still be made by laying a little dung upon the knots of the straw or haulm of those potatoes that do appear, and covering them with mould; each knot or joint thus ordered will, if the weather prove wet afterwards, produce more potatoes than the original roots.

From the smallest potatoes planted whole, from four to six pounds at a root were obtained, and some of the single potatoes weighed near two pounds. These were dug in as before-mentioned, in trenches where the ground was covered with weeds, and the soil was a stiff loamy clay.

A good crop may be obtained by laying potatoes upon turf at about 12 or 14 inches apart, and upon beds of about six feet wide; on each side of which a trench should be opened about three feet wide, and the turf that comes from thence should be laid with the grassy side downwards upon the potatoes; a spit of mould should next be taken from the trenches, and be spread over the turf; and in like manner the whole plot of ground that is designed to be planted must be treated. And remark, that when the young shoots appear, another spit of mould from the trenches should be strewn over the beds so as to cover the shoots; this will prevent the frost from injuring them, encourage them to expand, and totally destroy the young weeds; and when the potatoes are taken up in the autumn, a careful person may turn the earth again into the trenches, so as to make the surface level; and it will be right to remark, that from the same ground a much better crop of potatoes may be obtained the following year.

For field planting, a good (if not the best) method is to dung the land, which should be once ploughed previous thereto; and when it is ploughed a second time, a careful person should drop the potato plants before the plough in every third furrow at about eight or

ten inches apart. Plants that are cut with two eyes are best for this purpose. The reason for planting them at so great a distance as every third furrow, is, that when the shoots appear, a horse-hoe may go upon the two vacant furrows to keep them clean; and after they are thus hoed, they should be moulded up in ridges; and if this crop be taken up about October or November, the land will be in excellent condition to receive a crop of wheat. Lands that are full of twitch or couch-grass may be made clean by this method, as the horse-hoeing is as good as a summer-fallow; and if, when the potatoes are taken up, women and children were to pick out such filth, not any traces of it would remain; and by laying it on heaps and burning it, a quantity of ashes would be produced for manure.

After ploughing, none should ever dibble in potatoes, as the persons who dibble, plant, or hoe them, will all tread the ground; by which means it will become so bound, that the young fibres cannot expand, as has been already observed. Good crops have indeed been obtained by ploughing the land twice, and dropping the plants in every other furrow, and by hand-hoeing and earthing them up afterwards as the gardeners do pease; but this method is not equal to the other.

Vacant places in hedge-rows might be grubbed and planted with potatoes, and a good crop might be expected, as the leaves of trees, thorns, &c. are a good manure, and will surprisingly encourage their growth, and gratify the wishes of the planter; who by cultivating such places, will then make the most of his ground, and it will be in fine order to receive a crop of corn the following year.

164
Account of the culture, expences, and produce of six acres of potatoes, being a fair part of near 70 acres, raised by John Billingsley, Esq; and for which the premium was granted him in the year 1784. Method of culture, &c. for which a premium was granted.

EXPENCES.		L. s. d.		
Plowing an oat-stubble in October 1783, at 4s. per acre	-	1	4	0
Cross-ploughing in March 1784	-	1	4	0
Harrowing, 2s. per acre	-	0	12	0
180 cart-loads of compost, 3l. per acre	-	18	0	0
42 sacks of seed-potatoes (each sack weighing 240 lb.) of the white sort	-	10	10	0
Cutting the sets, 6d. per sack	-	1	1	0
Setting on ridges eight feet wide (leaving an interval of two feet for an alley) 6d. for every 20 yards	-	10	12	0
Hoeing, at 5s. per acre	-	1	10	0
Digging up the two feet interval, and throwing the earth on the plants, at 10s. per acre	-	3	0	0
Digging up the crop, at 8d. for every 20 yards in length, the breadth being 8 feet	-	14	6	0
Labour and expence of securing in pits, wear and tear of baskets, straw, reed, spikes, &c. 10s. per acre	-	3	0	0
Rent	-	6	0	0
Tithe	-	1	10	0
		72	9	0
Profit	-	73	11	0
		L. 146	0	0
		PRO-		

Practice.

PRODUCE.

L. s. d.

Practice.

600 sacks of best potatoes at 4s.

120 0 0

120 sacks middle-sized, 3s. 6d.

11 0 0

50 of small, 2s.

5 0 0

N. B. Each sack 240lb.

L. 146 0 0

The field on which the above experiment was made, was an oat-stubble in the autumn of 1783. In October it was ploughed, and left in a rough state during the winter. In April it was cross-ploughed and harrowed. On the 8th of May the field was marked out into beds or ridges eight feet wide, leaving a space of two feet wide for an alley between every two ridges. The manure (a compost of stable dung, virgin earth, and scrapings of a turnpike road) was then brought on the land, and deposited in small heaps on the centre of each ridge, in the proportion of about 30 cart-loads to each acre. A trench was then opened with a spade, breadth-way of the ridge, about four inches deep; in this trench the potato sets were placed, at the distance of nine inches from each other; the dung was then spread in a trench on the sets, and a space or slit of 14 inches in breadth dug in upon them. When the plants were about six inches high, they were carefully hoed, and soon after the two feet intervals between the ridges were dug, and the contents thrown around the young plants. This refreshment, added to the ample manuring previously bestowed, produced such a luxuriance and rapidity of growth, that no weed could show its head.

165
Best method of taking them up.

The shortest and most certain method of taking up potatoes, is to plough once round every row at the distance of four inches, removing the earth from the plants, and gathering up with the hand all the potatoes that appear. The distance is made four inches, to prevent cutting the roots, which are seldom found above that distance from the row on each side. When the ground is thus cleared by the plough, raise the potatoes with a fork having three broad toes or claws; which is better than a spade, as it does not cut the potatoes. The potatoes thus laid above ground must be gathered with the hand. By this method scarce a potato will be left.

166
Of preserving them.

As potatoes are a comfortable food for the low people, it is of importance to have them all the year round. For a long time, potatoes in Scotland were confined to the kitchen-garden; and after they were planted in the field, it was not imagined at first that they could be used after the month of December. Of late years, they have been found to answer even till April; which has proved a great support to many a poor family, as they are easily cooked, and require neither kiln nor mill. But there is no cause for stopping there. It is easy to preserve them till the next crop: When taken out of the ground, lay in the corner of a barn a quantity that may serve till April, covered from frost with dry straw pressed down: bury the remainder in a hole dug in dry ground, mixed with the husks of dried oats, sand, or the dry leaves of trees, over which build a stack of hay or corn. When the pit is opened for taking out the potatoes, the eyes of what have a tendency to push must be cut out; and this cargo will serve all the month of June. To be still more certain of making the old crop meet the new, the setting of a small quantity may be delayed till June, to be taken

up at the ordinary time before frost. This cargo, having not arrived to full growth, will not be so ready to push as what are set in April.

If the old crop happen to be exhausted before the new crop is ready, the interval may be supplied by the potatoes of the new crop that lie next the surface, to be picked up with the hand; which, far from hurting the crop, will rather improve it.

3. CARROT and PARSNIP.

Of all roots, a carrot requires the deepest soil. It ought at least to be a foot deep, all equally good from top to bottom. If such a soil be not in the farm, it may be made artificially by trench-ploughing, which brings to the surface what never had any communication with the sun or air. When this new soil is sufficiently improved by a crop or two with dung, it is fit for bearing carrots. Beware of dunging the year when the carrots are sown; for with fresh dung they seldom escape rotten scabs.

The only soils proper for that root are a loam and a sandy soil.

The ground must be prepared by the deepest furrow that can be taken, the sooner after harvest the better; immediately upon the back of which, a ribbing ought to succeed, as directed for barley. At the end of March, or beginning of April, which is the time of sowing the seed, the ground must be smoothed with a brake. Sow the seed in drills, with intervals of a foot for hand-hoeing; which is no expensive operation where the crop is confined to an acre or two: but if the quantity of ground be greater, the intervals ought to be three feet, in order for horse-hoeing.

In flat ground without ridges, it may be proper to make parallel furrows with the plough, ten feet from each other, in order to carry off any redundant moisture.

At Parlington in Yorkshire, from the end of September to the first of May, 20 work-horses, four bullocks, and six milk-cows, were fed on the carrots that grew on three acres; and these animals never tasted any other food but a little hay. The milk was excellent: and, over and above, 30 hogs were fattened upon what was left by the other beasts. We have this fact from undoubted authority.

The culture of parsnips is the same with that of carrots.

III. Plants cultivated for Leaves, or for both Leaves and Root.

THERE are many garden-plants of these kinds. The plants proper for the field are cabbage red and white, colewort plain and curled, turnip-rooted cabbage, and the root of scarcity.

1. Cabbage is an interesting article in husbandry. It is easily raised, is subject to few diseases, resists frost more than turnip, is palatable to cattle, and sooner fills them than turnip, carrot, or potatoes.

The season for setting cabbage depends on the use it is intended for. If intended for feeding in November, December, and January, plants procured from seed sown the end of July the preceding year must be set in March or April. If intended for feeding in March, April, and May, the plants must be set the first week

Practice.

week of the preceding July, from seed sown in the end of February or beginning of March the same year. The late setting of the plants retards their growth; by which means they have a vigorous growth the following spring. And this crop makes an important link in the chain that connects winter and summer green food. Where cabbage for spring-food happens to be neglected, a few acres of rye, sown at Michaelmas, will supply the want. After the rye is consumed, there is time sufficient to prepare the ground for turnip.

And now to prepare a field for cabbage. Where the plants are to be set in March, the field must be made up after harvest in ridges three feet wide. In that form let it lie all winter, to be mellowed with air and frost. In March, take the first opportunity, between wet and dry, to lay dung in the furrows. Cover the dung with a plough, which will convert the furrow into a crown, and consequently the crown into a furrow. Set the plants upon the dung, distant from each other three feet. Plant them so as to make a straight line cross the ridges, as well as along the furrows, to which a gardener's line stretched perpendicularly cross the furrows will be requisite. This will set each plant at the distance precisely of three feet from the plants that surround it. The purpose of this accuracy is to give opportunity for ploughing, not only along the ridges, but cross them. This mode is attended with three signal advantages: it saves hand-hoeing, it is a more complete dressing to the soil, and it lays earth neatly round every plant.

If the soil be deep and composed of good earth, a trench-ploughing after the preceding crop will not be amiss; in which case, the time for dividing the field into three-feet ridges, as above, ought to be immediately before the dunging for the plants.

If weeds happen to rise so close to the plants as not to be reached by the plough, it will require very little labour to destroy them with a hand-hoe.

Unless the soil be much infested with annuals, twice ploughing after the plants are set will be a sufficient dressing. The first removes the earth from the plants; the next, at the distance of a month or so, lays it back.

Where the plants are to be set in July, the field must be ribbed as directed for barley. It ought to have a slight ploughing in June before the planting, in order to loosen the soil, but not so as to bury the surface-earth; after which the three-feet ridges must be formed, and the other particulars carried on as directed above with respect to plants that are to be set in March.

170
Cultivation
of the turnip-rooted
cabbages.

2. As to the *turnip-rooted cabbages*, their importance and value seem only to have been lately ascertained. In the Bath Society Papers we have the following account of Sir Thomas Beavor's method of cultivating them; which from experience he found to be cheaper and better than any other.

"In the first or second week of June, I sow the same quantity of seed, hoe the plants at the same size, leave them at the same distance from each other, and treat them in all respects like the common turnip. In this method I have always obtained a plentiful crop of them; to ascertain the value of which I need only inform you, that on the 23d day of April last, having then two acres left of my crop, sound, and in great

perfection, I divided them by fold hurdles into three parts of nearly equal dimensions. Into the first part I put 24 small bullocks of about 30 stone weight each (14 lb. to the stone), and 30 middle-sized fat wethers, which, at the end of the first week, after they had eaten down the greater part of the leaves, and some part of the roots, I shifted into the second division, and then put 70 lean sheep into what was left of the first; these fed off the remainder of the turnips left by the fat stock; and so they were shifted through the three divisions, the lean stock following the fat as they wanted food, until the whole was consumed.

"The 24 bullocks and 30 fat wethers continued in the turnips until the 21st of May, being exactly four weeks; and the 70 lean sheep until the 29th, which is one day over four weeks: so that the two acres kept me 24 small bullocks and 110 sheep four weeks (not reckoning the overplus day of keeping the lean sheep); the value, at the rate of keeping at that season, cannot be estimated in any common year at less than 4 d. a-week for each sheep, and 1 s. 6 d. per week for each bullock, which would amount together to the sum of L. 14: 10: 8 for the two acres.

"You will hardly, I conceive, think I have set the price of keeping the stock at too high a rate; it is beneath the price here in almost every spring, and in this last it would have cost double, could it have been procured; which was so far from being the case, that hundreds of sheep and lambs here were lost, and the rest greatly pinched for want of food.

"You will observe, gentlemen, that in the valuation of the crop above mentioned I have claimed no allowance for the great benefit the farmer receives by being enabled to suffer his grass to get into a forward growth, nor for the superior quality of these turnips in fattening his stock; both which circumstances must stamp a new and a great additional value upon them. But as their continuance on the land may seem to be injurious to the succeeding crop, and indeed will deprive the farmer totally of either oats or barley; so to supply that loss I have always sown buck-wheat on the first earth upon the land from which the turnips were thus fed off; allowing one bushel of seed per acre, for which I commonly receive from five to six quarters per acre in return. And that I may not throw that part of my land out of the same course of tillage with the rest, I sow my clover or other grass-seeds with the buck-wheat, in the same manner as with the oat or barley crops, and have always found as good a *layer* (ley) of it afterwards.

"Thus you see, that in providing a most incomparable vegetable food for cattle, in that season of the year in which the farmer is generally most distressed, and his cattle almost starved, a considerable profit may likewise be obtained, much beyond what is usually derived from his former practice, by the great produce and price of a crop raised at so easy an expence as that of buck-wheat, which with us sells commonly at the same price as barley, oftentimes more, and but very rarely for less.

"The land on which I have usually sown turnip-rooted cabbages is a dry mixed soil, worth 15 s. per acre."

To the preceding account the Society have subjoined the following note: "Whether we regard the importance

Practice.

171

Their utility and value.

Practice portance of the subject, or the clear and practical information which the foregoing letter conveys, it may be considered as truly interesting as any we have ever been favoured with: and therefore it is recommended in the strongest manner to farmers in general, that they adopt a mode of practice so decisively ascertained to be in a high degree judicious and profitable."

172
Recom-
mendation
by the Bath
Society.

To raise the turnip-rooted cabbage for transplanting, the best method yet discovered is, to breast-plough and burn as much old pasture as may be judged necessary for the seed-bed; two perch well stocked with plants will be sufficient to plant an acre. The land should be dug as shallow as possible, turning the ashes in; and the seed should be sown the beginning of April.

173
To raise
the turnip-
rooted cab-
bage for
transplant-
ing.

The land intended for the plantation to be cultivated and dunged as for the common turnip. About Midsummer (or sooner if the weather will permit) will be a proper time for planting, which is best done in the following manner: the land to be thrown into *one-bout* ridges, upon the tops of which the plants are to be set, at about 18 inches distance from each other. As soon as the weeds rise, give a hand-hoeing, afterwards run the ploughs in the intervals, and fetch a furrow from each ridge, which, after laying a fortnight or three weeks, is again thrown back to the ridges; if the weeds rise again, it is necessary to give them another hand-hoeing.

If the young plants in the seed-bed should be attacked by the fly, sow wood-ashes over them when the dew is on, which will effectually prevent the ravages they would otherwise make.

174
Culture of
the root of
scarcity.

3. The *racine de disette*, or root of scarcity (*Betacila*), delights in a rich loamy land well dunged. It is directed to be sown in rows, or broad cast, and as soon as the plants are of the size of a goose-quill, to be transplanted in rows of 18 inches distance, and 18 inches apart, one plant from the other: care must be taken in the sowing, to sow very thin, and to cover the seed, which lays in the ground about a month, an inch only.—In transplanting, the root is not to be shortened, but the leaves cut at the top; the plant is then to be planted with a setting stick, so that the upper part of the root shall appear about half an inch out of the ground; this last precaution is very necessary to be attended to. These plants will strike root in twenty-four hours, and a man a little accustomed to planting will plant with ease 1800 or 2000 a-day. In the seed-bed, the plants, like all others, must be kept clear of weeds: when they are planted out, after once hoeing, they will take care of themselves, and suffocate every kind of weed near them.

The best time to sow the seed is from the beginning of March to the middle of April: it is, however, advised to continue sowing every month until the beginning of July, in order to have a succession of plants. Both leaves and roots have been extolled as excellent both for man and beast. This plant is said not to be liable, like the turnip, to be destroyed by insects, for no insect touches it, nor is it affected by excessive drought, or the changes of seasons. Horned cattle, horses, pigs, and poultry, are exceedingly fond of it when cut small. The leaves may be gathered every 12 or 15 days; they are from 30 to 40 inches long, by 22 to 25 inches broad. This plant is excellent for milch cows, when given to them in proper proportions,

as it adds much to the quality as well as quantity of their milk; but care must be taken to proportion the leaves with other green food, otherwise it would abate the milk, and fatten them too much, it being of so exceeding a fattening quality. To put all these properties beyond doubt, however, further experiments are wanting.

SECT. IV. Culture of Grass.

THE latter end of August, or the beginning of September, is the best season for sowing grass-seeds, as there is time for the roots of the young plants to fix themselves before the sharp frosts set in. It is scarce necessary to say, that moist weather is best for sowing; the earth being then warm, the seeds will vegetate immediately; but if this season prove unfavourable, they will do very well the middle of March following.

If you would have fine pasture, never sow on foul land. On the contrary, plough it well, and clear it from the roots of couch-grass, rest harrow, fern, broom, and all other noxious weeds. If these are suffered to remain, they will soon get above, and destroy your young grass. Rake these up in heaps, and burn them on the land, and spread the ashes as a manure. These ploughings and harrowings should be repeated in dry weather. And if the soil be clayey and wet, make some under-drains to carry off the water, which, if suffered to remain, will not only chill the grass, but make it sour. Before sowing, lay the land as level and fine as possible. If your grass-seeds are clean (which should always be the case), three bushels will be sufficient per acre. When sown, harrow it in gently, and roll it in with a wooden roller. When it comes up, fill up all the bare spots by fresh seed, which, if rolled to fix it, will soon come up and overtake the rest.

In Norfolk they sow clover with their grasses, particularly with rye-grass; but this should not be done except when the land is designed for grass only three or four years, because neither of these kinds will last long in the land. Where you intend it for a continuance, it is better to mix only small white Dutch clover, or marle grass, with your other grass seed, and not more than eight pounds to an acre. These are abiding plants, spread close on the surface, and make the sweetest feed of any for cattle. In the following spring, root up thistles, hemlock, or any large plants that appear. The doing this while the ground is soft enough to permit your drawing them by the roots, and before they feed, will save you infinite trouble afterwards.

The common method of proceeding in laying down fields to grass is extremely injudicious. Some sow barley with their grasses, which they suppose to be useful in shading them, without considering how much the corn draws away the nourishment from the land.

Others take their seeds from a foul hay-rick; by which means, besides filling the land with rubbish and weeds, what they intend for dry soils may have come from moist, where it grew naturally, and *vice versa*. The consequence is, that the ground, instead of being covered with a good thick sward, is filled with plants unnatural to it. The kinds of grass most eligible for pasture-lands are, the annual-meadow, creeping, and fine bent, the fox-tail's, and crested dog's-tail, the poas, the fescues, the vernal, oat-grass,

175
Of laying
down fields
to grass.

176

Difference

of kinds of

grass.

Practice.

grafs, and the ray, or rye-grafs. We do not, however, approve of fowing all these kinds together; for not to mention their ripening at different times, by which means you can never cut them all in perfection and full vigour, no kind of cattle are fond of all alike.

Horses will scarcely eat hay which oxen and cows will thrive upon; sheep are particularly fond of some kinds, and refuse others. The Darnel-grafs, if not cut before several of the other kinds are ripe, becomes so hard and wiry in the stalks, that few cattle care to eat it.

Such gentlemen as wish a particular account of the above-mentioned grasses, will be amply gratified in consulting Mr Stillingfleet on this subject. He has treated it with great judgment and accuracy, and those who follow his directions in the choice of their grasses will be under no small obligation to him for the valuable information he has given them. The substance of his observations are given in the article GRASSES in this Dictionary.

The grasses commonly sown for pasture, for hay, or to cut green for cattle, are red clover, white clover, yellow clover, rye-grafs, narrow-leaved plaitain commonly called *ribwort*, saintfoin, and lucerne.

Red clover is of all the most proper to be cut green for summer-food. It is a biennial plant when suffered to perfect its seed; but when cut green, it will last three years, and in a dry soil longer. At the same time the safest course is to let it stand but a single year: if the second year's crop happen to be scanty, it proves, like a bad crop of pease, a great encourager of weeds by the shelter it affords them.

Here, as in all other crops, the goodness of seed is of importance. Choose plump seed of a purple colour, because it takes on that colour when ripe. It is red when hurt in the drying, and of a faint colour when unripe.

177
Of red clo-
ver.

Red clover is luxuriant upon a rich soil, whether clay, loam, or gravel: it will grow even upon a moor, when properly cultivated. A wet soil is its only bane; for there it does not thrive.

• Plate V.
fig. 7.

To have red clover in perfection, weeds must be extirpated, and stones taken off. The mould ought to be made as fine as harrowing can make it; and the surface be smoothed with a light roller, if not sufficiently smooth without it. This gives opportunity for distributing the seed evenly: which must be covered by a small harrow with teeth no larger than that of a garden-rake, three inches long, and six inches asunder*. In harrowing, the man should walk behind with a rope in his hand fixed to the back part of the harrow, ready to disentangle it from stones, clods, turnip or cabbage-roots, which would trail the seed, and displace it.

Nature has not determined any precise depth for the seed of red clover more than of other seed. It will grow vigorously from two inches deep, and it will grow when barely covered. Half an inch may be reckoned the most advantageous position in clay soil, a whole inch in what is light or loose. It is a vulgar error, that small seed ought to be sparingly covered. Misled by that error, farmers commonly cover their clover-feed with a bushy branch of thorn; which not only covers it unequally, but leaves part on the surface to wither in the air.

The proper season for sowing red-clover, is from the
No 8.

middle of April to the middle of May. It will spring from the first of March to the end of August; but such liberty ought not to be taken except from necessity.

Practice.

There cannot be a greater blunder in husbandry than to be sparing of seed. Ideal writers talk of sowing an acre with four pounds. That quantity of seed, say they, will fill an acre with plants as thick as they ought to stand. This rule may be admitted where grain is the object; but it will not answer with respect to grass. Grass-seed cannot be sown too thick: the plants shelter one another; they retain all the dew; and they must push upward, having no room laterally. Observe the place where a sack of pease, or of other grain, has been set down for sowing: the seed dropt there accidentally grows more quickly than in the rest of the field sown thin out of hand. A young plant of clover, or of saintfoin, according to Tull, may be raised to a great size where it has room; but the field will not produce half the quantity. When red clover is sown for cutting green, there ought not to be less than 24 pounds to an acre. A field of clover is seldom too thick: the smaller a stem be, the more acceptable it is to cattle. It is often too thin; and when so, the stems tend to wood.

Red clover is commonly sown with grain; and the most proper grain has been found by experience to be flax. The soil must be highly cultivated for flax as well as for red clover. The proper season of sowing is the same for both; the leaves of flax being very small, admit of free circulation of air; and flax being an early crop, is removed so early as to give the clover time for growing. In a rich soil it has grown so fast, as to afford a good cutting that very year. Next to flax, barley is the best companion to clover. The soil must be loose and free for barley; and so it ought to be for clover: the season of sowing is the same; and the clover is well established in the ground before it is overtopped by the barley. At the same time, barley commonly is sooner cut than either oats or wheat. In a word, barley is rather a nurse than a stepmother to clover during its infancy. When clover is sown in spring upon wheat, the soil, which has lain five or six months without being stirred, is an improper bed for it; and the wheat, being in the vigour of growth, overtops it from the beginning. It cannot be sown along with oats, because of the hazard of frost; and when sown as usual among the oats three inches high, it is overtopped, and never enjoys free air till the oats be cut. Add, that where oats are sown upon the winter-furrow, the soil is rendered as hard as when under wheat.—Red clover is sometimes sown by itself without other grain: but this method, beside losing a crop, is not salutary; because clover in its infant state requires shelter.

As to the quantity of grain proper to be sown with clover: In a rich soil well pulverized, a peck of barley on an English acre is all that ought to be ventured; but there is not much soil in Scotland so rich. Two Linlithgow firloths make the proper quantity for an acre that produces commonly six bolls of barley; half a firloth for what produces nine bolls. To those who are governed by custom, so small a quantity will be thought ridiculous. Let them only consider, that a rich soil in perfect good order, will from a single seed

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Practice. of barley produce 20 or 30 vigorous stems. People may flatter themselves with the remedy of cutting barley green for food, if it happen to oppress the clover. This is an excellent remedy in a field of an acre or two; but the cutting an extensive field for food must be slow; and while one part is cutting, the clover is smothered in other parts.

179
White and
yellow clo-
ver, rib-
wort, and
rye-grafs.

The culture of white clover, of yellow clover, of ribwort, of rye-grafs, is the same in general with that of red clover. We proceed to their peculiarities. Yellow clover, ribwort, rye-grafs, are all of them early plants, blooming in the end of April or beginning of May. The two latter are evergreens, and therefore excellent for winter-pasture. Rye-grafs is less hurt by frost than any of the clovers, and will thrive in a moist soil: nor in that soil is it much affected by drought. In a rich soil, it grows four feet high: even in the dry summer 1775, it rose to three feet eight inches; but it had gained that height before the drought came on. These grasses are generally sown with red clover for producing a plentiful crop. The proportion of seed is arbitrary; and there is little danger of too much. When rye-grafs is sown for procuring seed, five firlots wheat-measure may be sown on an acre; and for procuring seed of ribwort, 40 pounds may be sown. The roots of rye-grafs spread horizontally: they bind the soil by their number; and tho' small, are yet so vigorous as to thrive in hard soil. Red clover has a large tap-root, which cannot penetrate any soil but what is open and free; and the largeness of the root makes the soil still more open and free. Rye-grafs, once a great favourite, appears to be discarded in most parts of Britain. The common practice has been, to sow it with red clover, and to cut them promiscuously the beginning of June for green food, and a little later for hay. This indeed is the proper season for cutting red clover, because at that time it begins to flower; but as at that time the seed of the rye-grafs is approaching to maturity, its growth is stopped for that year, as much as of oats or barley cut after the seed is ripe. Oats or barley cut green before the seed forms, will afford two other cuttings; which is the case of rye-grafs, of yellow clover, and of ribwort. By such management, all the profit will be drawn that these plants can afford.

When red clover is intended for seed, the ground ought to be cleared of weeds, were it for no other purpose than that the seed cannot otherwise be preserved pure: what seeds escape the plough ought to be taken out by the hand. In England, when a crop of seed is intended, the clover is always first cut for hay. This appears to be done, as in fruit-trees, to check the growth of the wood, in order to encourage the fruit. This practice will not answer in Scotland, as the seed would often be too late for ripening. It would do better to eat the clover with sheep till the middle of May, which would allow the seed to ripen. The seed is ripe when, upon rubbing it between the hands, it parts readily from the husk. Then apply the scythe, spread the crop thin, and turn it carefully. When perfectly dry, take the first opportunity of a hot day for threshing it on boards covered with a coarse sheet. Another way less subject to risk, is to stack the dry hay, and to thresh it in the end of April. After the first threshing, expose the husks to the sun, and thresh them over and over till no seed remain. Nothing is more effica-

Vol. I. Part I.

cious than a hot sun to make the husk part with its seed; in which view it may be exposed to the sun by parcels, an hour or two before the flail is applied.

White clover, intended for seed, is managed in the same manner. No plant ought to be mixed with rye-grafs that is intended for seed. In Scotland, much rye-grafs seed is hurt by transgressing that rule. The seed is ripe when it parts easily with the husk. The yellowness of the stem is another indication of its ripeness; in which particular it resembles oats, barley, and other culmiferous plants. The best manner to manage a crop of rye-grafs for seed, is to bind it loosely in small sheaves, widening them at the bottom to make them stand erect; as is done with oats in moist weather. In that state they may stand till sufficiently dry for threshing. By this method they dry more quickly, and are less hurt by rain, than by close binding and putting the sheaves in shocks like corn. The worst way of all is to spread the rye-grafs on the moist ground, for it makes the seed malten. The sheaves, when sufficiently dry, are carried into close carts to where they are to be threshed on a board, as mentioned above for clover. Put the straw in a rick when a hundred stone or so are threshed. Carry the threshing-board to the place where another rick is intended; and so on till the whole seed be threshed, and the straw ricked. There is necessity for close carts to save the seed, which is apt to drop out in a hot sun; and, as observed above, a hot sun ought always to be chosen for threshing. Carry the seed in sacks to the granary or barn, there to be separated from the husks by a fanner. Spread the seed thin upon a timber-floor, and turn it once or twice a-day till perfectly dry. If suffered to take a heat, it is useless for seed.

The writers on agriculture reckon sainfoin preferable to clover in many respects: They say, that it produces a larger crop; that it does not hurt cattle when eaten green; that it makes better hay; that it continues four times longer in the ground; and that it will grow on land that will bear no other crop.

Sainfoin has a very long tap-root, which is able to pierce very hard earth. The roots grow very large; and the larger they are, they penetrate to the greater depth; and hence it may be concluded, that this grass, when it thrives well, receives a great part of its nourishment from below the *staple* of the soil: of course, a deep dry soil is best for the culture of sainfoin. When plants draw their nourishment from that part of the soil that is near the surface, it is not of much consequence whether their number be great or small. But the case is very different when the plants receive their food, not only near, but also deep below, the surface. Besides, plants that shoot their roots deep are often supplied with moisture, when those near the surface are parched with drought.

To render the plants of sainfoin vigorous, it is necessary that they be sown thin. The best method of doing this is by a drill; because, when sown in this manner, not only the weeds, but also the supernumerary plants, can easily be removed. It is several years before sainfoin comes to its full strength; and the number of plants sufficient to stock a field, while in this imperfect state, will make but a poor crop for the first year or two. It is therefore necessary that it be sown in such a manner as to make it easy to take up plants

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180
Culture of
sainfoin.

Practice.

Practice.

in such numbers, and in such order, as always to leave in the field the proper number in their proper places. This can only be done, with propriety, by sowing the plants in rows by a drill. Supposing a field to be drilled in rows at ten inches distance, the partitions may be hand-hoed, and the rows dressed in such a manner as to leave a proper number of plants. In this situation the field may remain two years; then one-fourth of the rows may be taken out in pairs, in such a manner as to make the beds of fifty inches, with six rows in each, and intervals of thirty inches, which may be ploughed. Next year, another fourth of the rows may be taken out in the same manner, so as to leave double rows with partitions of ten inches, and intervals of thirty: All of which may be hoed at once or alternately, as it may be found most convenient.

The great quantity of this grass which the writers on this subject assure us may be raised upon an acre, and the excellency and great value of the hay made of it, should induce farmers to make a complete trial of it, and even to use the spade in place of the hoe, or hoe-plough, if necessary.

The plants taken up from a field of sainfoin may be set in another field; and if the transplanting of this grass succeeds as well as the transplanting of lucerne has done with Mr Lunin de Chateauxvieux, the trouble and expence will be sufficiently recompensed by the largeness of the crops. In transplanting, it is necessary to cut off great part of the long tap-root: this will prevent it from striking very deep into the soil, and make it push out large roots in a sloping direction from the cut end of the tap-root. Sainfoin managed in this manner, will thrive even on shallow land that has a wet bottom, provided it be not overstocked with plants.

Whoever inclines to try the culture of this grass in Scotland, should take great pains in preparing the land, and making it as free from weeds as possible.

In England, as the roots strike deep in that chalky soil, this plant is not liable to be so much injured by drought as other grasses are, whose fibres lie horizontally, and lie near the surface. The quantity of hay produced is greater and better in quality than any other. But there is one advantage attending this grass, which renders it superior to any other; and that arises from feeding with it milch cows. The prodigious increase of milk which it makes is astonishing, being nearly double that produced by any other green food. The milk is also better, and yields more cream than any other; and the butter procured from it much better coloured and flavoured.

181
Remarks
on the cul-
ture of sain-
foin in
England.

The following remarks by an English farmer are made from much experience and observation.

Sainfoin is much cultivated in those parts where the soil is of a chalky kind. It will always succeed well where the roots run deep; the worst soil of all for it is where there is a bed of cold wet clay, which the tender fibres cannot penetrate. This plant will make a greater increase of produce, by at least 30 times, than common grass or turf on poor land. Where it meets with chalk or stone, it will extend its roots through the cracks and chinks to a very great depth in search of nourishment. The dryness is of more

consequence than the richness of land for sainfoin; although land that is both dry and rich will always produce the largest crops.

Practice.

It is very commonly sowed broadcast; but it is found to answer best in drills, especially if the land be made fine by repeated ploughing, rolling, and harrowing. Much depends on the depth which this seed is sown. If it be buried more than an inch deep, it will seldom grow; and if left uncovered, it will push out its roots above ground, and these will be killed by the air. March and the beginning of April are the best seasons for sowing it, as the severity of winter and the drought of summer are equally unfavourable to the young plants. A bushel of seed sown broadcast, or half that quantity in drills, if good, is sufficient for an acre. The drills should be 30 inches apart, to admit of horse-hoeing between them. Much, however, depends on the goodness of the seed, which may be best judged of by the following marks.

The husk being of a bright colour, the kernel plump, of a grey or bluish colour without, and, if cut across, greenish and fresh within; if it be thin and furrowed, and of a yellowish cast, it will seldom grow. When the plants stand single, and have room to spread, they produce the greatest quantity of herbage, and the seed ripens best. But farmers in general, from a mistaken notion of all that appears to be waste ground being unprofitable, plant them so close, that they choke and impoverish each other, and often die in a few years. Single plants run deepest and draw most nourishment; they are also easiest kept free from weeds. A single plant will often produce half a pound of hay, when dry. On rich land this plant will yield two good crops in a year, with a moderate share of culture. A good crop must not be expected the first year; but, if the plants stand not too thick, they will increase in size the second year prodigiously.

No cattle should be turned on the field the first winter after the corn is off with which it was sown, as their feet would injure the young plants. Sheep should not come on the following summer, because they would bite off the crown of the plants, and prevent their shooting again. A small quantity of soapers ashes as a top-dressing will be of great service, if laid on the first winter.

If the sainfoin be cut just before it comes into bloom, it is admirable food for horned cattle; and if cut thus early, it will yield a second crop the same season. But if it proves a wet season, it is better to let it stand till its bloom be perfected; for great care must be taken, in making it into hay, that the flowers do not drop off, as cows are very fond of them; and it requires more time than other hay in drying. Sainfoin is so excellent a fodder for horses, that they require no oats while they eat it, although they be worked hard all the time. Sheep will also be fattened with it faster than with any other food.

If the whole season for cutting proves very rainy, it is better to let the crop stand for seed, as that will amply repay the loss of the hay; because it will not only fetch a good price, but a peck of it will go as far as a peck and a half of oats for horses.

The best time of cutting the seeded sainfoin is, when the greatest part of the seed is well filled, the first blown.

Practice. blown ripe, and the last blown beginning to open. For want of this care some people have lost most of their seed by letting it stand too ripe. Seeded sainfoin should always be cut in a morning or evening, when the dews render the stalks tender. If cut when the sun shines hot, much of the seed will fall out and be lost.

182
Its excel-
lence as
food for
cows.

An acre of very ordinary land, when improved by this grass, will maintain four cows very well from the first of April to the end of November; and afford, besides, a sufficient store of hay to make the greater part of their food the four months following.

If the soil be tolerably good, a field of sainfoin will last from 15 to 20 years in prime; but at the end of seven or eight years, it will be necessary to lay on a moderate coat of well-rotted dung; or, if the soil be very light and sandy, of marle. By this means the future crops, and the duration of the plants in health and vigour, will be greatly increased and prolonged. Hence it will appear, that for poor land there is nothing equal to this grass in point of advantage to the farmer.

Clover will last only two years in perfection; and often, if the soil be cold and moist, near half the plants will rot, and bald patches be found in every part of the field the second year. Besides, from our frequent rains during the month of September, many crops left for feeding are lost. But from the quantity and excellent quality of this grass (sainfoin), and its ripening earlier, and continuing in vigour so much longer, much risk and certain expence is avoided, and a large annual profit accrues to the farmer.

183
Culture of
lucerne.

The writers on agriculture, ancient as well as modern, bestow the highest encomiums upon lucerne as affording excellent hay, and producing very large crops. Lucerne remains at least 10 or 12 years in the ground, and produces about eight tons of hay upon the Scots acre. There is but little of it cultivated in Scotland. However, it has been tried in several parts of that country; and it is found, that, when the seed is good, it comes up very well, and stands the winter frost. But the chief thing which prevents this grass from being more used in Scotland, is the difficulty of keeping the soil open and free from weeds. In a few years the surface becomes so hard, and the turf so strong, that it destroys the lucerne before the plants have arrived at their greatest perfection: so that lucerne can scarce be cultivated with success there, unless some method be fallen upon of destroying the natural grass, and prevent the surface from becoming hard and impenetrable. This cannot be done effectually by any other means than horse-hoeing. This method was first proposed by Mr Tull, and afterwards practised successfully by M. de Chateauvieux near Geneva. It may be of use therefore to give a view of that gentleman's method of cultivating lucerne.

He does not mention any thing particular as to the manner of preparing the land; but only observes in general, that no pains should be spared in preparing it. He tried the sowing of lucerne both in rows upon the beds where it was intended to stand, and likewise the sowing it in a nursery, and afterwards transplanting it into the beds prepared for it. He prefers transplanting; because, when transplanted, part of the tap-root

is cut off, and the plant shoots out a number of lateral branches from the cut part of the root, which makes it spread its roots nearer the surface, and consequently renders it more easily cultivated: besides, this circumstance adapts it to a shallow soil, in which, if left in its natural state, it would not grow.

Practice.

The transplanting of lucerne is attended with many advantages. The land may be prepared in the summer for receiving the plants from the nursery in autumn; by which means the field must be in a much better situation than if the seed had been sown upon it in the spring. By transplanting, the rows can be made more regular, and the intended distances more exactly observed; and consequently the hoeing can be performed more perfectly, and with less expence. Mr Chateauvieux likewise tried the lucerne in single beds three feet wide, with single rows; in beds three feet nine inches wide, with double rows; and in beds four feet three inches wide, with triple rows. The plants in the single rows were six inches asunder, and those in the double and triple rows were about eight or nine inches. In a course of three years he found, that a single row produced more than a triple row of the same length. The plants of lucerne, when cultivated by transplantation, should be at least six inches asunder, to allow them room for extending their crowns.

He further observes, that the beds or ridges ought to be raised in the middle; that a small trench, two or three inches deep, should be drawn in the middle; and that the plants ought to be set in this trench, covered with earth up to the neck. He says, that if the lucerne be sown in spring, and in a warm soil, it will be ready for transplanting in September; that, if the weather be too hot and dry, the transplanting should be delayed till October; and that, if the weather be unfavourable during both these months, this operation must be delayed till spring. He further directs, that the plants should be carefully taken out of the nursery, so as not to damage the roots; that the roots be left only about six or seven inches long; that the green crops be cut off within about two inches of the crown; that they be put into water as soon as taken up, there to remain till they are planted; and that they should be planted with a planting-stick, in the same manner as cabbages.

He does not give particular directions as to the times of horse-hoeing; but only says in general, that the intervals should be stirred once in the month during the whole time that the lucerne is in a growing state. He likewise observes, that great care ought to be taken not to suffer any weeds to grow among the plants, at least for the first two or three years; and for this purpose, that the rows, as well as the edges of the intervals where the plough cannot go, should be weeded by the hand.

Burnet is peculiarly adapted to poor land; besides, it proves an excellent winter-pasture when hardly burnet. any thing else vegetates. Other advantages are, It makes good butter; it never blows or swells cattle; it is fine pasture for sheep; and will flourish well on poor, light, sandy, or stony soils, or even on dry chalk hills.

184
Culture of

The cultivation of it is neither hazardous nor expensive.

Practice. five. If the land is prepared as is generally done for turnips, there is no danger of its failing. After the first year, it will be attended with very little expence, as the flat circular spread of its leaves will keep down, or prevent the growth of weeds.

On the failure of turnips, either from the fly or the black worm, some of our farmers have sown the land with burnet, and in March following had a fine pasture for their sheep and lambs. It will perfect its seed twice in a summer; and this seed is said to be as good as oats for horses; but it is too valuable to be applied to that use.

It is sometimes sown late in the spring with oats and barley, and succeeds very well; but it is best to sow it singly in the beginning of July, when there is a prospect of rain, on a small piece of land, and in October following transplant it in rows two feet apart, and about a foot distant in the rows. This is a proper distance, and gives opportunity for hoeing the intervals in the succeeding spring and summer.

After it is fed down with cattle, it should be harrowed clean. Some horses will not eat it freely at first, but in two or three days they are generally very fond of it. It affords rich pleasant milk, and in great plenty.

A gentleman farmer near Maidstone some years since sowed four acres as soon as the crop of oats were got off, which was the latter end of August. He threw in 12 pounds of seed per acre, broadcast; and no rain falling until the middle of September, the plants did not appear before the latter end of that month. There was however a good crop; and in the spring he set the plants out with a turnip-hoe, leaving them about a foot distant from each other. But the drill method is preferable, as it saves more than half the seed. The land was a poor dry gravel, not worth three shillings an acre for any thing else.

The severest frost never injures this plant; and the oftener it is fed the thicker are its leaves, which spring constantly from its root.

SECT. V. *Rotation of Crops.*

185
Rotation of crops.

No branch of husbandry requires more skill and sagacity than a proper rotation of crops, so as to keep the ground always in heart, and yet to draw out of it the greatest profit possible. Some plants rob the soil, others are gentle to it: some bind, others loosen. The nice point is, to intermix crops, so as to make the greatest profit consistently with keeping the ground in trim. In that view, the nature of the plants employed in husbandry must be accurately examined.

186
Culmiferous and leguminous plants.
* No 120, 321.

The difference between culmiferous and leguminous plants, is occasionally mentioned above*. With respect to the present subject, a closer inspection is necessary. Culmiferous plants, having small leaves and few in number, depend mostly on the soil for nourishment, and little on the air. During the ripening of the seed, they draw probably their whole nourishment from the soil; as the leaves by this time, being dry and withered, must have lost their power of drawing nourishment from the air. Now, as culmiferous plants are chiefly cultivated for their seed, and are not cut down till the seed be fully ripe, they may be pronounced all of them to be robbers, some more, some less. But such plants, while young, are all leaves; and in that state draw

most of their nourishment from the air. Hence it is, that where cut green for food to cattle, a culmiferous crop is far from being a robber. A hay-crop accordingly, even where it consists mostly of rye-grass, is not a robber, provided it be cut before the seed is formed; which at any rate it ought to be, if one would have hay in perfection. And the foggage, excluding the frost by covering the ground, keeps the roots warm. A leguminous plant, by its broad leaves, draws much of its nourishment from the air. A cabbage, which has very broad leaves, and a multitude of them, owes its growth more to the air than to the soil. One fact is certain, that a cabbage cut and hung up in a damp place, preserves its verdure longer than other plants. At the same time, a seed is that part of a plant which requires the most nourishment; and for that nourishment a culmiferous plant must be indebted entirely to the soil. A leguminous crop, on the contrary, when cut green for food, must be very gentle to the ground. Pease and beans are leguminous plants; but being cultivated for seed, they seem to occupy a middle station: their seed makes them more severe than other leguminous crops cut green; their leaves, which grow till reaping, make them less severe than a culmiferous plant left to ripen.

These plants are distinguished no less remarkably by the following circumstance. All the seeds of a culmiferous plant ripen at the same time. As soon as they begin to form, the plant becomes stationary, the leaves wither, the roots cease to push, and the plant when cut down is blanched and sapless. The seeds of a leguminous plant are formed successively: flowers and fruit appear at the same time in different parts of the plant. This plant accordingly is continually growing, and pushing its roots. Hence the value of bean or pease straw above that of wheat or oats: the latter is withered and dry when the crop is cut; the former, green and succulent. The difference therefore, with respect to the soil, between a culmiferous and leguminous crop, is great. The latter, growing till cut down, keeps the ground in constant motion, and leaves it to the plough loose and mellow. The former gives over growing long before reaping; and the ground, by want of motion, turns compact and hard. Nor is this all. Dew falling on a culmiferous crop after the ground begins to harden, rests on the surface, and is sucked up by the next sun. Dew that falls on a leguminous crop, is shaded from the sun by the broad leaves, and sinks at leisure into the ground. The ground accordingly, after a culmiferous crop, is not only hard, but dry: after a leguminous crop, it is not only loose, but soft and unctuous.

Of all culmiferous plants, wheat is the most severe, by the long time it occupies the ground without admitting a plough. And as the grain is heavier than that of barley or oats, it probably requires more nourishment than either. It is observed above, that as pease and beans draw part of their nourishment from the air by their green leaves while allowed to stand, they draw the less from the ground; and by their constant growing they leave it in good condition for subsequent crops. In both respects they are preferable to any culmiferous crop.

Culmiferous crops, as observed above, are not robbers when cut green: the soil, far from hardening, is kept

Practice kept in constant motion by the pushing of the roots, and is left more tender than if it had been left at rest without any bearing crop.

Bulbous-rooted plants are above all successful in dividing and pulverizing the soil. Potato-roots grow six, eight, or ten inches under the surface; and, by their size and number, they divide and pulverize the soil better than can be done by the plough; consequently, whatever be the natural colour of the soil, it is black when a potato-crop is taken up. The potato, however, with respect to its quality of dividing the soil, must yield to a carrot or parsnip; which are large roots, and pierce often to the depth of 18 inches. The turnip, by its tap-root, divides the soil more than can be done by a fibrous-rooted plant; but as its bulbous root grows mostly above ground, it divides the soil less than the potato, the carrot, or the parsnip. Red clover, in that respect, may be put in the same class with turnip.

Whether potatoes or turnip be the more gentle crop, appears a puzzling question. The former bears seed, and probably draws more nourishment from the soil than the latter, when cut green. On the other hand, potatoes divide the soil more than turnip, and leave it more loose and friable. It appears no less puzzling, to determine between cabbage and turnip: the former draws more of its nourishment from the air, the latter leaves the soil more free and open.

The result of the whole is what follows: Culmiferous plants are robbers; some more, some less: they at the same time bind the soil; some more, some less. Leguminous plants in both respects are opposite: if any of them rob the soil, it is in a very slight degree; and all of them without exception loosen the soil. A culmiferous crop, however, is generally the more profitable: but few soils can long bear the burden of such crops, unless relieved by interjected leguminous crops. These, on the other hand, without a mixture of culmiferous crops, would soon render the soil too loose.

These preliminaries will carry the farmer some length in directing a proper rotation of crops. Where dung, lime, or other manure, can be procured in plenty to recruit the soil after severe cropping, no rotation is more proper or profitable in a strong soil, than wheat, pease or beans, barley, oats, fallow. The whole farm may be brought under this rotation, except so far as hay is wanted. But as such command of manure is rare, it is of more importance to determine what should be the rotation when no manure can be procured but the dung collected in the farm. Considering that culmiferous crops are the more profitable in rich land, it would be proper to make them more frequent than the other kind. But as there are few soils in Scotland that will admit such frequent culmiferous crops without suffering, it may be laid down as a general rule, that alternate crops, culmiferous and leguminous, ought to form the rotation. Nor are there many soils that will stand good, even with this favourable rotation, unless relieved from time to time by pasturing a few years. If such extended rotation be artfully carried on, crops without end may be obtained in a tolerable good soil, without any manure but what is produced in the farm.

It is scarce necessary to be mentioned, being known to every farmer, that clay answers best for wheat,

moist clay for beans, loam for barley and pease, light soil for turnip, sandy soil for rye and buck-wheat; and that oats thrive better in coarse soil than any other grain. Now, in directing a rotation, it is not sufficient that a culmiferous crop be always succeeded by a leguminous: attention must also be given, that no crop be introduced that is unfit for the soil. Wheat, being a great binder, requires more than any other crop a leguminous crop to follow. But every such crop is not proper: potatoes are the greatest openers of soil; but they are improper in a wheat soil. Neither will turnip answer, because it requires a light soil. A very loose soil, after a crop of rye, requires rye-grass to bind it, or the treading of cattle in pasturing: but to bind the soil, wheat must not be ventured; for it succeeds ill in loose soil.

Another consideration of moment in directing the rotation, is to avoid crops that encourage weeds. Pease is the fittest of all crops for succeeding to wheat, because it renders the ground loose and mellow, and the same soil agrees with both. But beware of pease, unless the soil be left by the wheat perfectly free of weeds; because pease, if not an extraordinary crop, foster weeds. Barley may be ventured after wheat, if the farmer be unwilling to lose a crop. It is indeed a robber; better, however, any crop, than run the hazard of poisoning the soil with weeds. But to prevent the necessity of barley after wheat, the land ought to be fallowed before the wheat: it cleans the ground thoroughly, and makes pease a secure crop after wheat. And after a good crop of pease, barley never fails. A horse-hoed crop of turnip is equal to a fallow for rooting out weeds; but turnip does not suit land that is proper for wheat. Cabbage does well in wheat soil; and a horse-hoed crop of cabbage, which eradicates weeds, is a good preparation for wheat to be succeeded by pease; and a crop of beans diligently hand-hoed, is in that view little inferior. As red clover requires the ground to be perfectly clean, a good crop of it ensures wheat, and next pease. In loam, a drilled crop of turnip or potatoes prepares the ground, equal to a fallow, for the same succession.

Another rule is, to avoid a frequent repetition of the same species; for to produce good crops, change of species is no less necessary than change of seed. The same species returning every second or third year, will infallibly degenerate, and be a scanty crop. This is remarkably the case of red clover. Nor will our fields bear pleasantly perpetual crops of wheat after fallow, which is the practice of some English farmers.

Hitherto of rotation in the same field. We add one rule concerning rotation in different fields; which is, to avoid crowding crops one after another in point of time; but to choose such as admit intervals sufficient for leisurely dressing, which gives opportunity to manage all with the same hands, and with the same cattle; for example, beans in January or February, pease and oats in March, barley and potatoes in April, turnip in June or July, wheat and rye in October.

For illustrating the foregoing rules, a few instances of exceptionable rotations will not be thought amiss. The following is an usual rotation in Norfolk. First, wheat after red clover. Secondly, barley. Third, turnip. Fourth, barley with red clover. Fifth, clover cut for hay. Sixth, a second year's crop of clover commonly

Practice.
187
The nature of soil considered, with regard to the rotation of crops.

188

Exceptionable rotations.

Practice. commonly pastured. Dung is given to the wheat and turnip.—Against this rotation several objections lie. Barley after wheat is improper. The two crops of barley are too near together. The second crop of clover must be very bad, if pasturing be the best way of consuming it; and if bad, it is a great encourager of weeds. But the strongest objection is, that red clover repeated so frequently in the same field cannot fail to degenerate; and of this the Norfolk farmers begin to be sensible.—Salton in East Lothian is a clay soil; and the rotation there is, wheat after fallow and dung. Second, barley after two ploughings; the one before winter, the other immediately before the seed is sown. Third, oats. Fourth, pease. Fifth, barley. Sixth, oats: and then fallow. This rotation consists chiefly of robbing crops. Pease are the only leguminous crop, which even with the fallow is not sufficient to loosen a stiff soil. But the soil is good, which in some measure hides the badness of the rotation.—About Seaton, and all the way from Preston to Gosford, the ground is still more severely handled: wheat after fallow and dung, barley, oats, pease, wheat, barley, oats, and then another fallow. The soil is excellent; and it ought indeed to be so, to support many rounds of such cropping.

In the parishes of Tranent, Aberlady, Dirleton, North-Berwick, and Athelstonefoord, the following rotations were formerly universal, and to this day are much more frequent than any other mode.

1. After fallow and dung, wheat, barley, oats, pease and beans, barley, oats, wheat.
2. After fallow and dung, barley, oats, pease and beans, wheat, barley, oats, pease, wheat.
3. After fallow and dung, wheat, oats, pease, barley, oats, wheat.
4. After fallow and dung, barley, oats, beans, wheat, pease, barley, oats.

In the several Tours of Young the itinerant farmer, are found, in the best counties of England, examples without end, of rotations no less exceptionable than many of those mentioned.

189
Fields not
to be kept
too long in
pasture.

Where a field is laid down for pasture in order to be recruited, it is commonly left in that state many years; for it is the universal opinion, that the longer it lies, the richer it becomes for bearing corn. This may be true; but in order to determine the mode of cropping, the important point is, what upon the whole is the most profitable rotation; not what may produce luxuriant crops at a distant period. Upon that point, it may be affirmed, that the farmer who keeps a field in pasture beyond a certain time, loses every year considerably; and that a few luxuriant crops of corn, after 20 years of pasture, and still more after 30, will not make up the loss.

Pasture-grass, while young, maintains many animals; and the field is greatly recruited by what they drop; it is even recruited by hay crops, provided the grass be cut before feeding. But as old grass yields little profit, the field ought to be taken up for corn when the pasture begins to fail; and after a few crops, it ought to be laid down again with grass seeds. Seduced by a chimerical notion, that a field, by frequent corn-crops, is fatigued and requires rest like a labouring man or animal, careful farmers give long rest to their fields by pasture, never adverting that it affords little profit. It

ought to be their study, to improve their soil, by making it free, and also retentive of moisture. If they accomplish these ends, they need not be afraid of exhausting the soil by cropping.

Where a farmer has access to no manure but what is his own production, the case under consideration, there are various rotations of crops, all of them good though perhaps not equally so. We shall begin with two examples, one in clay and one in free soil, each of the farms 90 acres. Six acres are to be inclosed for a kitchen-garden, in which there must be annually a crop of red clover, for summer-food to the working cattle. As there are annually 12 acres in hay, and 12 in pasture, a single plough with good cattle will be sufficient to command the remaining 60 acres.

190
*Examples
of rotations.*

Rotation in a clay soil.

Incl.	1775.	1776.	1777.	1778.	1779.	1780.
1.	Fallow.	Wheat.	Pease.	Barley.	Hay.	Oats.
2.	Wheat.	Pease.	Barley.	Hay.	Oats.	Fallow.
3.	Pease.	Barley.	Hay.	Oats.	Fallow.	Wheat.
4.	Barley.	Hay.	Oats.	Fallow.	Wheat.	Pease.
5.	Hay.	Oats.	Fallow.	Wheat.	Pease.	Barley.
6.	Oats.	Fallow.	Wheat.	Pease.	Barley.	Hay.
7.	Pasture.	Pasture.	Pasture.	Pasture.	Pasture.	Pasture.

When the rotation is completed, the seventh inclosure having been six years in pasture, is ready to be taken up for a rotation of crops which begins with oats in the year 1781, and proceeds as in the sixth inclosure. In the same year 1781, the fifth inclosure is made pasture, for which it is prepared by sowing pasture-grass seeds with the barley of the year 1780. And in this manner may the rotation be carried on without end. Here the labour is equally distributed; and there is no hurry nor confusion. But the chief property of this rotation is, that two culmiferous or white-corn crops are never found together; by a due mixture of crops, the soil is preserved in good heart without any adventitious manure. At the same time, the land is always producing plentiful crops: neither hay nor pasture get time to degenerate. The whole dung is laid upon the fallow.

Every farm that takes a grass crop into the rotation must be inclosed, which is peculiarly necessary in a clay soil, as nothing is more hurtful to clay than poaching.

Rotation in a free soil.

Incl.	1775.	1776.	1777.	1778.	1779.	1780.
1.	Turnip.	Barley.	Hay.	Oats.	Fallow.	Wheat.
2.	Barley.	Hay.	Oats.	Fallow.	Wheat.	Turnip.
3.	Hay.	Oats.	Fallow.	Wheat.	Turnip.	Barley.
4.	Oats.	Fallow.	Wheat.	Turnip.	Barley.	Hay.
5.	Fallow.	Wheat.	Turnip.	Barley.	Hay.	Oats.
6.	Wheat.	Turnip.	Barley.	Hay.	Oats.	Fallow.
7.	Pasture.	Pasture.	Pasture.	Pasture.	Pasture.	Pasture.

For the next rotation, the seventh inclosure is taken up for corn, beginning with an oat-crop, and proceeding in the order of the fourth inclosure; in place of which, the third inclosure is laid down for pasture by sowing pasture-grasses with the last crop in that inclosure, being barley. This rotation has all the advantages

Practice. ges of the former. Here the dung is employed on the turnip-crop.

We proceed to consider what rotation is proper for carse clay. The farm we propose consists of 73 acres. Nine are to be inclosed for a kitchen-garden, affording plenty of red clover to be cut green for the farm-cattle. The remaining 64 acres are divided into four inclosures, 16 acres each, to be cropped as in the following table.

Incl.	1775.	1776.	1777.	1778.
1.	Beans.	Barley.	Hay.	Oats.
2.	Barley.	Hay.	Oats.	Beans.
3.	Hay.	Oats.	Beans.	Barley.
4.	Oats.	Beans.	Barley.	Hay.

Here the dung ought to be applied to the barley.

Many other rotations may be contrived, keeping to the rules above laid down. Fallow, for example, wheat, pease and beans, barley, cabbage, oats, for clay. Here dung must be given both to the wheat and cabbage. For free soil, drilled turnip, barley, red clover, wheat upon a single furrow, drilled potatoes, oats. Both the turnip and potatoes must have dung. Another for free soil: turnip drilled and dunged, red clover, wheat on a single furrow with dung, pease, barley, potatoes, oats. The following rotation has proved successful in a soil proper for wheat. 1. Oats with red clover, after fallow without dung. 2. Hay. The clover-flubble dunged, and wheat sown the end of October with a single furrow. 3. Wheat. 4. Pease. 5. Barley. Fallow again. Oats are taken the first crop, to save the dung for the wheat. Oats always thrive on a fallow, though without dung, which is not the case of barley. But barley seldom fails after pease. In strong clay soil, the following rotation answers. 1. Wheat after fallow and dung. 2. Beans sown under furrow as early as possible. Above the beans, sow pease end of March, half a boll per acre, and harrow them in. The two grains will ripen at the same time. 3. Oats or barley on a winter furrow with grass-seeds. 4. Hay for one year or two; the second growth pastured. Lay what dung can be spared on the hay-flubble, and sow wheat with a single furrow. 5. Wheat. 6. Beans or pease. 7. Oats. Fallow again.

SECT. VI. *Of Reaping Corn and Hay Crops, and Storing them up for Use.*

¹⁹¹ Of ripeness. CULMIFEROUS plants are ripe when the stem is totally white: they are not fully ripe if any green streaks remain. Some farmers are of opinion, that wheat ought to be cut before it is fully ripe. Their reasons are, first, that ripe wheat is apt to shake; and next, that the flour is not so good. With respect to the last, it is contrary to nature, that any seed can be better in an unripe state than when brought to perfection: nor will it be found so upon trial. With respect to the first, wheat, at the point of perfection, is not more apt to shake than for some days before: the husk begins not to open till after the seed is fully ripe; and then the suffering the crop to stand becomes ticklish; after the minute of ripening, it should be cut down in an instant, if possible.

This leads to the hands that are commonly engaged to cut down corn. In Scotland, the universal practice was, to provide a number of hands, in proportion to the extent of the crop, without regard to the time of ripening. By this method, the reapers were often idle for want of work; and what is much worse, they had often more work than they could overtake, and ripe fields were laid open to shaking winds. The Lothians have long enjoyed weekly markets for reapers, where a farmer can provide himself with the number he wants; and this practice is creeping into neighbouring shires. Where there is no opportunity of such markets, neighbouring farmers ought to agree in borrowing and lending their reapers.

One should imagine, that a caution against cutting corn when wet is unnecessary; yet from the impatience of farmers to prevent shaking, no caveat is more so. Why do they not consider, that corn standing dries in half a day; when, in a close sheaf, the weather must be favourable if it dry in a month? in moist weather it will never dry.

With respect to the manner of cutting, we must pre-¹⁹³ Manner of mife, that barley is of all the most difficult grain to be cutting. dried for keeping. Having no husk, rain has an easy access; and it has a tendency to malten when wet. Where the ground is properly smoothed by rolling, it seems best to cut it down with the scythe. This manner being more expeditious than the sickle, removes it sooner from danger of wind; and gives a third more straw, which is a capital article for dung, where a farm is at a distance from other manure. We except only corn that has lodged; for there the sickle is more convenient than the scythe. As it ought to be dry when cut, bind it up directly: if allowed to lie any time in the swath, it is apt to be discoloured.—Barley sown with grass-seeds, red clover especially, requires a different management. Where the grass is cut along with it, the difficulty is great of getting it so dry as to be ventured in a stack. The best way is, to cut the barley with a sickle above the clover, so as that nothing but clean barley is bound up. Cut with a scythe the flubble and grass: they make excellent winter-food. The same method is applicable to oats; with this only difference, that when the field is exposed to the south-west wind, it is less necessary to bind immediately after mowing. As wheat commonly grows higher than any other grain, it is difficult to manage it with the scythe; for which reason the sickle is preferred in England. Pease and beans grow so irregularly, as to make the sickle necessary.

The best way for drying pease, is to keep separate ¹⁹⁴ Drying of the handfuls that are cut; though in this way they wet pease. easily, they dry as soon. In the common way of heaping pease together for composing a sheaf, they wet as easily, and dry not near so soon. With respect to beans, the top of the handful last cut ought to be laid on the bottom of the former; which gives ready access to the wind. By this method pease and beans are ready for the stack in half the ordinary time.

A sheaf commonly is made as large as can be con-¹⁹⁵ Size of tained in two lengths of the corn made into a rope. To sheaves save frequent tying, the binder presses it down with his knee, and binds it so hard as totally to exclude the air. If there be any moisture in the crop, which seldom fails, a process of fermentation and putrefaction commences

Practice.

in the sheaf; which is perfected in the stack, to the destruction both of corn and straw. How stupid is it, to make the size of a sheaf depend on the height of the plants! By that rule, a wheat-sheaf is commonly so weighty, as to be unmanageable by ordinary arms: it requires an effort to move it, that frequently bursts the knot, and occasions loss of grain, beside the trouble of a second tying. Sheaves ought never to be larger than can be contained in one length of the plant, cut close to the ground; without admitting any exception, if the plants be above eighteen inches high. The binder's arm can then compress the sheaf sufficiently, without need of his knee. The additional hands that this way of binding may require, are not to be regarded compared with the advantage of drying soon. Corn thus managed may be ready for the stack in a week; it seldom in the ordinary way requires less than a fortnight, and frequently longer. Of a small sheaf compressed by the arm only, the air pervades every part; nor is it so apt to be unloosed as a large sheaf, how ever firmly bound. We omit the gathering of sheaves into shocks, because the common method is good, which is to place the shocks directed to the south-west, in order to resist the force of the wind. Five sheaves on each side make a sufficient stay; and a greater number cannot be covered with two head-sheaves.

196
Carrying
off the
wheat.

Every article is of importance that hastens the operation in a country, like Scotland, subjected to unequal harvest-weather; for which reason, the most expeditious method should be chosen for carrying corn from the field to the stack-yard. Our carriages are generally too small or too large. A sledge is a very awkward machine: many hands are required, and little progress made. Waggon and large carts are little less dilatory, as they must stand in the yard till unloaded sheaf by sheaf. The best way is, to use long carts moveable upon the axle, so as at once to throw the whole load on the ground; which is forked up to the stack by a hand appointed for that purpose. By this method, two carts will do the work of four or five.

197
Of stacking.

Building round stacks in the yard is undoubtedly preferable to housing corn. There it is shut up from the air; and it must be exceedingly dry, if it contract not a mustiness, which is the first step to putrefaction. Add to this, that in the yard, a stack is preserved from rats and mice by being set on a pedestal: whereas no method has hitherto been invented for preserving corn in a house from such destructive vermin. The proper manner of building, is to make every sheaf incline downward from its top to its bottom. Where the sheaves are laid horizontally, the stack will take in rain both above and below. The best form of a stack is that of a cone placed on a cylinder; and the top of the cone should be formed with three sheaves drawn to a point. If the upper part of the cylinder be a little wider than the under, so much the better.

198
Covering
the stacks.

The delaying to cover a stack for two or three weeks, though common, is, however, exceedingly absurd; for if much rain fall in the interim, it is beyond the power of wind to dry the stack. Vegetation begun in the external parts, shuts out the air from the internal; and to prevent a total putrefaction, the stack must be thrown down and exposed to the air every sheaf. In order to have a stack covered the moment it is finished, straw and ropes ought to be ready; and

N^o 8.

the covering ought to be so thick as to be proof against rain. Practice.

Scotland is subject not only to floods of rain, but to high winds. Good covering guards against the former, and ropes artfully applied guards against the latter. The following is a good mode. Take a hay-rope well twisted, and surround the stack with it, two feet or so below the top. Surround the stack with another such rope immediately below the easing. Connect these two with ropes in an up-and-down position, distant from each other at the easing about five or six feet. Then surround the stack with other circular ropes parallel to the two first mentioned, giving them a twist round every one of those that lie up and down, by which the whole will be connected together in a sort of net-work. What remains is, to finish the two feet at the top of the stack. Let it be covered with bunches of straw laid regularly up and down; the under part to be put under the circular rope first mentioned, which will keep it fast, and the upper part be bound by a small rope artfully twisted, commonly called *the crown of the stack*. This method is preferable to the common way of laying long ropes over the top of the stack, and tying them to the belting-rope; which flattens the top, and makes it take in rain. A stack covered in the way here described, will stand two years secure both against wind and rain; a notable advantage in this variable climate.

The great aim in making hay is, to preserve as much of the sap as possible. All agree in this; and yet differ widely in the means of making that aim effectual. To describe all the different means would be equally tedious and unprofitable. We shall confine ourselves to two, which appear preferable to all others. A crop of rye-grass and yellow clover ought to be spread as cut. A day or two after, when the dew is evaporated, rake it into a number of parallel rows along the field, termed *wind-rows*, for the convenience of putting it up into small cocks. After turning the rows once and again, make small cocks weighing a stone or two. At the distance of two days or so, put two cocks into one, observing always to mix the tops and bottoms together, and to take a new place for each cock, that the least damage possible may be done to the grass. Proceed in putting two cocks into one, till sufficiently dry for tramp-ricks of 100 stone each. The easiest way of erecting tramp-ricks, is to found a rick in the middle of the row of cocks that are to compose it. The cocks may be carried to the rick by two persons joining arms together. When all the cocks are thus carried to the rick within the distance of 40 yards or so, the rest of the cocks will be more expeditiously carried to the rick, by a rope wound about them and dragged by a horse. Two ropes are sufficient to secure the ricks from wind the short time they are to stand in the field. In the year 1775, 10,000 stone were put into tramp-ricks the fourth day after cutting. In a country so wet as many parts of Scotland are, expedition is of mighty consequence in the drying both of and hay corn. With respect to hay intended for horned cattle, it is by the generality held an improvement, that it be heated a little in the stack. But we violently suspect this doctrine to have been invented for excusing indolent management. An ox, it is true, will eat such hay; but it will always be found that he prefers sweet hay; and

199

Hay-making.

5

Practice. it cannot well be doubted, but that such hay is the most salutary and the most nourishing.

200
Hay of red
clover.

The making hay consisting chiefly of red clover, requires more care. The season of cutting is the last week of June, when it is in full bloom; earlier it may be cut, but never later. To cut it later would indeed produce a weightier crop; but a late first cutting makes the second also late, perhaps too late for drying. At the same time, the want of weight in an early first cutting, is amply compensated by the weight of the second.

When the season is too variable for making hay of the second growth, mix straw with that growth, which will be a substantial food for cattle during winter. This is commonly done by laying strata of the straw and clover alternately in the stack. But by this method, the strata of clover, if they do not heat, turn mouldy at least, and unpalatable. The better way is, to mix them carefully with the hand before they be put into the stack. The dry straw imbibes moisture from the clover and prevents heating.

201
Other me-
thod.

* *Essays on
Agriculture,*
Vol I. p. 186.

But the best method of hay-making seems to be that recommended by Mr Anderson*. "Instead," says he, "of allowing the hay to lie, as usual in most places, for some days in the swathe after it is cut, and afterwards alternately putting it up into cocks and spreading it out, and tedding it in the sun, which tends greatly to bleach the hay, exhales its natural juices, and subjects it very much to the danger of getting rain, and thus runs a great risk of being good for little, I make it a general rule, if possible, never to cut hay but when the grass is quite dry; and then make the gatherers follow close upon the cutters,—putting it up immediately into small cocks about three feet high each when new put up, and of as small a diameter as they can be made to stand with; always giving each of them a slight kind of thatching, by drawing a few handfuls of the hay from the bottom of the cock all around, and laying it lightly upon the top with one of the ends hanging downwards. This is done with the utmost ease and expedition; and when it is once in that state, I consider my hay as in a great measure out of danger: for unless a violent wind should arise immediately after the cocks are put up, so as to overturn them, nothing else can hurt the hay; as I have often experienced, that no rain, however violent, ever penetrates into these cocks but for a very little way. And, if they are dry put up, they never fit together so closely as to heat; although they acquire, in a day or two, such a degree of firmness, as to be in no danger of being overturned by wind after that time, unless it blows a hurricane.

"In these cocks I allow the hay to remain, until, upon inspection, I judge that it will keep in pretty large tramp-cocks (which is usually in one or two weeks, according as the weather is more or less favourable, when two men, each with a long pronged pitch-

VOL. I. Part I.

Practice. fork, lift up one of these small cocks between them with the greatest ease, and carry them one after another to the place where the tramp-cock is to be built (A): and in this manner they proceed over the field till the whole is finished.

202
Advantages
of this me-
thod.
"The advantages that attend this method of making hay, are, That it greatly abridges the labour; as it does not require above the one-half of the work that is necessary in the old method of turning and tedding it: That it allows the hay to continue almost as green as when it is cut, and preserves its natural juices in the greatest perfection; for, unless it be the little that is exposed to the sun and air upon the surface of the cocks, which is no more bleached than every straw of hay saved in the ordinary way; the whole is dried in the most slow and equal manner that could be desired; and, lastly, That it is thus in a great measure secured from almost the possibility of being damaged by rain. This last circumstance deserves to be much more attended to by the farmer than it usually is at present; as I have seen few who are sufficiently aware of the loss that the quality of their hay sustains by receiving a slight shower after it is cut, and before it is gathered; the generality of farmers seeming to be very well satisfied if they get in their hay without being absolutely rotted; never paying the least attention to its having been several times wetted while the hay was making. But, if these gentlemen will take the trouble at any time to compare any parcel of hay that has been made perfectly dry, with another parcel from the same field that has received a shower while in the swathe, or even a copious dew, they will soon be sensible of a very manifest difference between them; nor will their horses or cattle ever commit a mistake in choosing between the two.

203
Particular
caution re-
quisite in
this method.
"Let it be particularly remarked, that in this manner of making hay, great care must be taken that it be dry when first put into the cocks; for, if it is in the least degree wet at that time, it will turn instantly mouldy, and fit together so as to become totally impervious to the air, and will never afterwards become dry till it is spread out to the sun. For this reason, if at any time during a course of good settled weather you should begin to cut in the morning before the dew is off the grass, keep back the gatherers till the dew is evaporated; allowing that which was first cut to lie till it is dry before it is cocked. In this case, you will almost always find that the uncut grass will dry sooner than that which has been cut when wet; and, therefore, the gatherers may always begin to put up that which is fresh cut before the other; which will usually require two or three hours to dry after the new-cut hay may be cocked. And if, at any time, in case of necessity, you should be obliged to cut your hay before it is dry, the same rule must be observed, always to allow it to remain in the swathe till it is quite dry: but, as there is always a great risk of being long in getting it

R r

up,

(A) If the hay is to be carried to any considerable distance, this part of the labour may be greatly abridged, by causing the carriers take two long sticks of a sufficient strength, and having laid them down by the small cocks parallel to one another, at the distance of one and a half, or two feet asunder, let them lift three or four cocks, one after another, and place them carefully above the sticks, and then carry them altogether, as if upon a hand-barrow, to the place where the large rick is to be built.

Practice.

up, and as it never in this case *wins* (A) so kindly as if it had been dry cut, the farmer ought to endeavour, if possible, in all cases, to cut his hay only when dry; even if it should cost him some additional expence to the cutters, by keeping them employed at any other work, or even allowing them to remain idle, if the weather should be variable or rainy.

“ But if there is a great proportion of clover, and the weather should chance to be close and calm at the time, it may, on some occasions, be necessary to open up these cocks a little, to admit some fresh air into them; in which case, after they have stood a day or two, it may be of great use to turn these cocks and open them up a little, which ought to be done in the driest time of the day; the operator taking that part of each cock which was the top, and with it forming the base of a new one; so that the part which was most exposed to the air becomes excluded from it, and that which was undermost comes to be placed upon the top, so as to make it all dry as equally as possible.

“ If the hay has not been damp when it was first put up, the cock may be immediately finished out at once; but if it is at all wet, it will be of great use to turn over only a little of the top of the cock at first, and leaving it in that state to dry a little, proceed to another, and a third, and fourth, &c. treating each in the same way; going on in that manner till you find that the inside of the first opened cock is sufficiently dried, when it will be proper to return to it, turning over a little more of it till you come to what is still damp, when you leave it and proceed to another, and so on round the whole; always returning afresh till the cocks are entirely finished. This is the best way of saving your hay, if you have been under the necessity of cutting it while damp; but it is always best to guard against this inconvenience, if possible.”

204
Hay-stacks.

In the yard, a stack of hay ought to be an oblong square, if the quantity be greater than to be easily flowed in a round stack; because a smaller surface is exposed to the air, than in a number of round stacks. For the same reason, a stack of pease ought to have the same form, the straw being more valuable than that of oats, wheat, or barley. The moment a stack is finished it ought to be covered; because the surface-hay is much damaged by withering in dry weather, and moistening in wet weather. Let it have a pavilion-roof; for more of it can be covered with straw in that shape, than when built perpendicular at the ends. Let it be roped as directed above for corn-stacks; with this difference only, that in an oblong square the ropes must be thrown over the top, and tied to the belt-rope below. This belt-rope ought to be fixed with pins to the stack: the reason is, that the ropes thrown over the stack will bag by the sinking of the stack, and may be drawn tight by lowering the belt-rope, and fixing it in its new position with the same pins.

The stems of hops, being long and tough, make excellent ropes; and it will be a saving article, to propagate a few plants of that kind for that very end.

A stack of rye-grass hay, a year old, and of a moderate size, will weigh, each cubic yard, 11 Dutch stone.

A stack of clover-hay in the same circumstances weighs somewhat less.

Practice.

SECT. VII. Manures.

THE manures commonly used are dung, lime, shell-marl, clay-marl, and stone-marl. Many other substances are used; shavings of horn, for example, refuse of malt, and even old rags: but as the quantity that can be procured is inconsiderable, and as their application is simple, we shall consume no time upon them.

Dung is the chief of all manures; because a quantity of it may be collected in every farm, and because it makes the quickest return. A field sufficiently dunged will produce good crops four or five years.

Dung of animals that chew the cud, being more thoroughly putrefied than that of others, is fit to be mixed with the soil without needing to be collected into a dunghill. A horse does not chew the cud; and in horse-dung may be perceived straw or rye-grass broken into small parts, but not dissolved: it is proper therefore that the putrefaction be completed in a dunghill. It ought to be mixed there with cool materials: so hot it is, that, in a dunghill by itself, it singes and burns instead of putrefying. The difference between the dung of a horse and of a horned animal, is visible in a pasture-field; the grass round the former is withered; round the latter, it is ranker and more verdant than in the rest of the field. A mixture of dry and moist stuff ought to be studied: the former attracting moisture from the latter, they become equally moist.

205
Dung.

To prevent sap from running out of a dunghill, its situation should be a little below the surface; and to prevent rain from running into it, it should be surrounded with a ring of sod. If the soil on which the dunghill stands be porous, let it be paved, to prevent the sap from sinking into the ground. If moisture happen to superabound, it may be led off by a small gutter to impregnate a quantity of rich mould laid down to receive it, which will make it equal to good dung.

206
Of a dunghill.

Straw should be prepared for the dunghill, by being laid under cattle, and sufficiently moistened. When laid dry into a dunghill, it keeps it open, admits too much air, and prevents putrefaction.

Dung from the stable ought to be carefully spread on the dunghill, and mixed with the former dung. When left in heaps upon the dunghill, fermentation and putrefaction go on unequally.

Complete putrefaction is of importance with regard to the seed of weeds that are in the dunghill: if they remain sound, they are carried out with the dung, and infest the ground. Complete putrefaction is of still greater importance by pulverizing the dung; in which condition it mixes intimately with the soil, and operates the most powerfully. In land intended for barley, undigested dung has a very bad effect: it keeps the ground open, admits drought, and prevents the seed from springing. On the other hand, when thoroughly rotted, it mixes with the soil, and enables it to retain moisture. It follows, that the properest time for dunging a field,

is

(A) By *winning* hay, is meant the operation by which it is brought from the succulent state of grass to that of a dry fodder.

Practice. is in its highest pulverization; at which time the earth mixes intimately with the dung. Immediately before setting cabbage, sowing turnip, or wheat, is a good time. Dung divides and spreads the most accurately when moist. Its intimate mixture with the soil is of such importance, that hands should be employed to divide and spread any lumps that may be in it.

207
Time for dunging.

208
Manner of dunging. Dung should be spread, and ploughed into the ground without delay. When a heap lies two or three weeks, some of the moisture is imbibed into the ground, which will produce tufts of corn more vigorous than in the rest of the field. There cannot be a worse practice than to lead out dung before winter, leaving it exposed to frost and snow. The whole spirit of the dung is extracted by rain, and carried off with it. The dung divested of its sap becomes dry in spring, and incapable of being mixed with the mould. It is turned over whole by the plough, and buried in the furrow.

209
Of collecting dung. As dung is an article of the utmost importance in husbandry, one should imagine, that the collecting it would be a capital article with an industrious farmer. Yet an ingenious writer, observing that the Jamaicans are in this particular much more industrious than the British, ascribes the difference to the difficulty of procuring dung in Jamaica. "In England, where the long winter enables a farmer to raise what quantity he pleases, it is not collected with any degree of industry. But in Jamaica, where there is no winter, and where the heat of the sun is a great obstruction, the farmer must be indefatigable, or he will never raise any dung." Cool interest is not alone a sufficient motive with the indolent to be active. As dung is of great importance in husbandry, a farmer cannot be too assiduous in collecting animal and vegetable substances that will rot. One article of that kind there is, to collect which there is a double motive, and yet is neglected almost every where. A farm full of weeds is a nuisance to the neighbourhood: it poisons the fields around; and the possessor ought to be disgraced as a pest to society. Now the cutting down every weed before the seed is formed, answers two excellent purposes. First, it encourages good crops, by keeping the ground clean. Next, these weeds mixed with other materials in a dunghill, may add considerably to the quantity of dung.

210
Of lime. Next of lime, which is a profitable manure, and greatly so when it can be got in plenty within a moderate distance. The benefit of lime is so visible, that the use of it has become general where the price and carriage are in any degree moderate.

211
Its operation. However people may differ in other particulars, all agree, that the operation of lime depends on its intimate mixture with the soil; and therefore that the proper time of applying it, is when it is perfectly powdered and the soil at the same time in the highest degree of pulverization. Lime of itself is absolutely barren; and yet it enriches a barren soil. Neither of the two produces any good effect without the other: and consequently, the more intimately they are mixed, the effect must be the greater.

Hence it follows, that lime ought always to be slaked with a proper quantity of water, because by that means it is reduced the most effectually into powder. Lime left to be slaked by a moist air, or accidental rain, is seldom or never thoroughly reduced into powder;

and therefore can never be intimately mixed with the soil. Sometimes an opportunity offers to bring home shell-lime before the ground is ready for it; and it is commonly thrown into a heap without cover, trusting to rain for slaking. The proper way is, to lay the shell-lime in different heaps on the ground where it is to be spread, to reduce these heaps into powder by slaking with water, and to cover the slaked lime with sod, so as to defend it from rain. One, however, would avoid as much as possible the bringing home lime before the ground be ready for it. Where allowed to lie long in a heap, there are two bad consequences: first, lime attracts moisture, even though well covered, and runs into clots, which prevents an intimate mixture; and, next, we know that burnt limestone, whether in shells or in powder, returns gradually into its original state of limestone; and upon that account also, is less capable of being mixed with the soil. And this is verified by a fact, that, after lying long, it is so hard bound together as to require a pick to separate the parts.

For the same reason, it is a bad practice, though common, to let spread lime lie on the surface all winter. The bad effects above mentioned take place here in part: and there is another; that rain washes the lime down to the furrows, and in a hanging field carries the whole away.

212
Time of liming. As the particles of powdered lime are both small and heavy, they quickly sink to the bottom of the furrow, if care be not taken to prevent it. In that view, it is a rule, that lime be spread and mixed with the soil immediately before sowing, or along with the seed. In this manner of application, there being no occasion to move it till the ground be stirred for a new crop, it has time to incorporate with the soil, and does not readily separate from it. Thus, if turnip-seed is to be sown broadcast, the lime ought to be laid on immediately before sowing, and harrowed in with the seed. If a crop of drilled turnip or cabbage be intended, the lime ought to be spread immediately before forming in drills. With respect to wheat, the lime ought to be spread immediately before seed-furrowing. If spread more early, before the ground be sufficiently broken, it sinks to the bottom. If a light soil be prepared for barley, the lime ought to be spread after seed-furrowing, and harrowed in with the seed. In a strong soil, it sinks not so readily to the bottom; and therefore, before sowing the barley, the lime ought to be mixed with the soil by a brake. Where moor is summer-fallowed for a crop of oats next year, the lime ought to be laid on immediately before the last ploughing, and braked in as before. It has sufficient time to incorporate with the soil before the land be stirred again.

213
Quantity. The quantity to be laid on depends on the nature of the soil. Upon a strong soil, 70 or 80 bolls of shells are not more than sufficient, reckoning four small firlots to the boll, termed *wheat-measure*; nor will it be an overdose to lay on 100 bolls. Between 50 and 60 may suffice upon medium soils; and upon the thin or gravelly, between 30 and 40. It is not safe to lay a much greater quantity on such soils.

It is common to lime a pasture-field immediately before ploughing. This is an unsafe practice; it is thrown to the bottom of the furrow, from which it is never fully gathered up. The proper time for liming

Practice.

a pasture field, intended to be taken up for corn, is a year at least, or two, before ploughing. It is washed in by rain among the roots of plants, and has time to incorporate with the soil.

215
Beat lime-
stone.

Limestone beat small makes an excellent manure; and supplies the want of powdered lime where there is no fuel to burn the limestone. Limestone beat small has not hitherto been much used as a manure; and the proportion between it and powdered lime has not been ascertained. What follows may give some light. Three pounds of raw lime is by burning reduced to two pounds of shell-lime. Yet nothing is expelled by the fire but the air that was in the limestone: the calcareous earth remains entire. *Ergo*, two pounds of shell-lime contain as much calcareous earth as three pounds of raw limestone. Shell-lime of the best quality, when flaked with water, will measure out to thrice the quantity. But as limestone loses none of its bulk by being burnt into shells, it follows, that three bushels of raw limestone contain as much calcareous earth as six bushels of powdered lime; and consequently, if powdered lime possess not some virtue above raw limestone, three bushels of the latter beat small should equal as a manure six bushels of the former.

216
Of shell-
marl.

Shell-marl, as a manure, is managed in every respect like powdered lime; with this only difference, that a fifth or a fourth part more in measure ought to be given. The reason is, that shell-marl is less weighty than lime; and that a boll of it contains less calcareous earth, which is the fructifying part of both.

217
Of clay
and stone-
marls.

Clay and stone marls, with respect to husbandry, are the same, though in appearance different.

The goodness of marl depends on the quantity of calcareous earth in it: which has been known to amount to a half or more. It is too expensive if the quantity be less than a third or a fourth part. Good marl is the most substantial of all manures; because it improves the weakest ground to equal the best borough-acres. The low part of Berwickshire, termed *the Merse*, abounds every where with this marl; and is the only county in Scotland where it is plenty.

Land ought to be cleared of weeds before marling; and it ought to be smoothed with the brake and harrow, in order that the marl may be equally spread. Marl is a fossil on which no vegetable will grow; its efficacy depends, like that of lime, on its pulverization, and intimate mixture with the soil. Toward the former, alternate drought and moisture contribute greatly, as also frost. Therefore, after being evenly spread, it ought to lie on the surface all winter. In the month of October it may be roused with a brake; which will bring to the surface, and expose to the air and frost, all the hard parts, and mix with the soil all that is powdered. In that respect it differs widely from dung and lime, which ought to be ploughed into the ground without delay. Oats is a hardy grain, which will answer for being the first crop after marling better than any other; and it will succeed though the marl be not thoroughly mixed with the soil. In that case, the marl ought to be ploughed in with an ebb furrow immediately before sowing, and braked thoroughly. It is ticklish to make wheat the first crop: if sown before winter, frost swells the marl, and is apt to throw the seed out of the ground; if sown in spring, it will suffer more than oats by want of due mixture.

Practice.

Summer is the proper season for marling; because in that season the marl, being dry, is not only lighter, but is easily reduced to powder. Frost, however, is not improper for marling, especially as in frost there is little opportunity for any other work.

Marl is a heavy body, and sinks to the bottom of the furrow, if indiscreetly ploughed. Therefore the first crop should always have an ebb furrow. During the growing of that crop, the marl has time to incorporate with the soil, and to become a part of it; after which it does not readily separate.

SECT. VIII. Principles and Operations of the New or Horse-hoeing Husbandry.

THE general properties attributed to the new husbandry may be reduced to two, *viz.* the promoting the growth of plants by hoeing, and the saving of seed; both of which are equally profitable to the farmer.

The advantages of tillage before sowing have already been pointed out. In this place we must confine ourselves to the utility of tillage after sowing. This kind of tillage is most generally known by the name of *horse-hoeing*. 218
Advanta-
ges ascribed
to horse-
hoeing.

Land sowed with wheat, however well it may be cultivated in autumn, sinks in the winter; the particles get nearer together, and the weeds rise; so that in spring, the land is nearly in the same situation as if it never had been ploughed. This, however, is the season when it should branch and grow with most vigour; and consequently stands most in need of ploughing or hoeing, to destroy the weeds, to supply the roots with fresh earth, and, by dividing anew the particles of the soil, to allow the roots to extend and collect nourishment.

It is well known, that, in gardens, plants grow with double vigour after being hoed or transplanted. If plants growing in arable land could be managed with ease and safety in this manner, it is natural to expect, that their growth would be promoted accordingly. Experience shows, that this is not only practicable, but attended with many advantages.

In the operation of hoeing wheat, though some of the roots be moved or broken, the plants receive no injury; for this very circumstance makes them send forth a greater number of roots than formerly, which enlarge their pasture, and consequently augment their growth.

Sickly wheat has often recovered its vigour after a good hoeing, especially when performed in weather not very hot or dry.

Wheat, and such grain as is sown before winter, requires hoeing more than oats, barley, or other grain sown in the spring; for, if the land has been well ploughed before the sowing of spring-corn, it neither has time to harden, nor to produce many weeds, not having been exposed to the winter's snow and rain.

Of Sowing.

As, in the practice of the New Husbandry, plants grow with greater vigour than by the old method, the land should be sowed thinner. It is this principle of the new husbandry that has been chiefly objected to; for, upon observing the land occupied by a small number of plants, people are apt to look upon all the vacant 219
Method of
the New
Husbandry.

Practice. cant space as lost. But this prejudice will soon be removed, when it is considered, that, in the best land cultivated in the common method, and sown very thick, each seed produces but one or two ears; that, in the same land sown thinner, every seed produces two or three ears; and that a single seed sometimes produces 18 or 21 ears.

In the common method, as there are many more plants than can find sufficient nourishment, and as it is impossible to assist them by hoeing, numbers die before they attain maturity, the greatest part remain sickly and drooping; and thus part of the seed is lost. On the contrary, in the new method, all the plants have as much food as they require; and as they are, from time to time, assisted by hoeing, they become so vigorous as to equal in their production the numerous but sickly plants cultivated in the common method.

Of HOEING.

THE new husbandry is absolutely impracticable in lands that are not easily ploughed. Attempting to cultivate land according to this husbandry, without attending to this circumstance, that it is practicable in no land excepting such as have already been brought into good tilth by the old method, has gone far to make it contemptible in many places.

220
The different hoeings.

When a field is in good tilth, it should be sown so thin as to leave sufficient room for the plants to extend their roots. After being well ploughed and harrowed, it must be divided into rows, at the distance of thirty inches from one another. On the sides of each of these rows, two rows of wheat must be sowed six inches distant from each other. By this means there will be an interval of two feet wide betwixt the rows, and every plant will have room enough to extend its roots, and to supply it with food. The intervals will likewise be sufficient for allowing the earth to be hoed or tilled without injuring the plants in the rows.

The first hoeing, which should be given before the winter, is intended to drain away the wet, and to dispose the earth to be mellowed by the frosts. These two ends will be answered by drawing two small furrows at a little distance from the rows, and throwing the earth taken from the furrows into the middle of the intervals. This first hoeing should be given when the wheat is in leaf.

The second hoeing, which is intended to make the plants branch, should be given after the hard frosts are over. To do this with advantage, after stirring the earth a little near the rows, the earth which was thrown in the middle of the intervals should be turned back into the furrows. This earth, having been mellowed by the winter, supplies the plants with excellent food, and makes the roots extend.

The third hoeing, which is intended to invigorate the stalk, should be given when the ears of the corn begin to show themselves. This hoeing may, however, be very slight.

But the last hoeing is of the greatest importance, as it enlarges the grain, and makes the ears fill at their extremities. This hoeing should be given when the wheat is in bloom; a furrow must be drawn in the middle of the interval, and the earth thrown to the right and left on the foot of the plants. This supports the plants, prevents them from being laid, and pre-

Practice. pares the ground for the next sowing, as the seed is then to be put in the middle of the ground that formed the intervals.

The best season for hoeing is two or three days after rain, or so soon after rain as the soil will quit the instrument in hoeing. Light dry soils may be hoed almost any time, but this is far from being the case with strong clay soils; the season for hoeing such is frequently short and precarious; every opportunity therefore should be carefully watched, and eagerly embraced. The two extremes of wet and dry, are great enemies to vegetation in strong clay soils. There is a period between the time of clay soils running together, so as to puddle by superfluous wet, and the time of their caking by drought, that they are as tractable as need be. This is the juncture for hoeing; and so much land as shall be thus seasonably hoed, will not cake or crust upon the surface, as it otherwise would have done, till it has been soaked or drenched again with rain; in which case the hoeing is to be repeated as soon as the soil will quit the instrument, and as often as necessary; by which time the growing crop will begin to cover the ground, so as to act as a screen to the surface of the land against the intense heat of the sun, and thereby prevent, in great measure, the bad effects of the soil's caking in dry weather.

By this successive tillage, or hoeing, good crops will be obtained, provided the weather is not very unfavourable.

But as strong vigorous plants are longer before they arrive at maturity, corn raised in the new way is later in ripening than any other, and must therefore be sown earlier.

In order to prepare the intervals for sowing again, some well-rooted dung may be laid in the deep furrows made in the middle of the intervals; and this dung must be covered with the earth that was before thrown towards the rows of wheat. But, if the land does not require mending, the deep furrow is filled without any dung. This operation should be performed immediately after harvest, that there may be time to give the land a slight stirring before the rows are sowed; which should occupy the middle of the space which formed the intervals during the last crop. The intervals of the second year take up the space occupied by the stubble of the first.

Supposing dung to be necessary, which is denied by many, a very small quantity is sufficient; a single layer, put in the bottom of each furrow, will be enough.

DESCRIPTION OF THE INSTRUMENTS commonly used in the NEW HUSBANDRY.

Fig. 1. is a marking plough. The principal use of this plough is to straight and regulate the ridges. The first line is traced by the eye, by means of three poles, placed in a straight line. The plough draws the first furrow in the direction of this line; and, at the same time, with the tooth A, fixed in the block of wood near the end of the cross-pole or slider B B, marks the breadth of the ridge at the distance intended. The ploughman next traces the second line or rutt made by the tooth, and draws a small furrow along it; and continues in this manner till the whole field is laid out in straight and equidistant ridges.

Fig.

Practice.

Plate VII.

Fig. 2. is a plough for breaking up lee, or turning up the bottom of land when greatly exhausted. By its construction, the width and depth of the furrows can be regulated to a greater certainty than by any other hitherto known in this country. Its appearance is heavy; but two horses are sufficient to plough with it in ordinary free land; and only four are necessary in the stiffest clay-soils. This plough is likewise easily held and tempered. A, is the sword fixed in the fizers B, which runs thro' a mortoise E, at the end of the beam C, and regulates the depth of the furrow by raising or depressing the beam; it is fixed by putting the pin D thro' the beam and sword, and is moveable at E.

Fig. 3. is a jointed brake-harrow with 24 teeth, shaped like coulter, and standing at about an angle of 80 degrees. By this instrument the land is finely pulverized, and prepared for receiving the seed from the drill. It requires four horses in stiff, and two in open, land. This harrow is likewise used for levelling the ridges; which is done by pressing it down by the handles where the ridge is high, and raising it up when low.

Fig. 4. is an angular wedding harrow, which may follow the brake when necessary. The seven hindmost teeth should stand at a more acute angle than the rest, in order to collect the weeds, which the holder can drop at pleasure, by raising the hinder part, which is fixed to the body of the harrow by two joints.

Fig. 5. is a pair of harrows with shafts. This harrow is used for covering the seed in the drills, the horse going in the furrow.

Fig. 6. is a drill-plough, constructed in such a manner as to sow at once two rows of beans, pease, or wheat. This machine is easily wrought by two horses. A, is the happer for containing the seed; B, circular boxes for receiving the seed from the happer; CC, two square boxes which receive the seed from small holes in the circular boxes, as they turn round; and last of all, the seed is dropped into the drills through holes in the square boxes, behind the coulter D. The cylinder E follows, which, together with the wheel F, regulates the depth of the coulter, and covers the seed; the harrow G comes behind all, and covers the seed more completely. HH, two sliders, which, when drawn out, prevent the seed from falling into the boxes; and, I, is a ketch which holds the rungs, and prevents the boxes from turning, and losing seed at the ends of the ridges.

Fig. 7. is a singlehoe-plough of a very simple construction, by which the earth in the intervals is stirred and laid up on both sides to the roots of the plants, and at the same time the weeds are destroyed. AA the mould-boards, which may be raised or depressed at pleasure, according as the farmer wants to throw the earth higher or lower upon the roots.

Plate VI.

Fig. 2. is a drill-rake for pease. This instrument, which is chiefly calculated for small inclosures of light grounds, is a sort of strong plough rake, with four large teeth at *a, a, b, b*, a little incurvated. The distance from *a* to *a*, and from *b* to *b*, is nine inches. The interval between the two inner teeth, *a* and *b*, is three feet six inches, which allows sufficient room for the hole-plough to move in. To the piece of timber *cc*, forming the head of the rake, are fixed the handles *d*, and the beam *e* to which the horse is fastened. When this instrument is drawn over a piece of land made thoroughly fine,

and the man who holds it bears upon the handles, four furrows, *f, g, h, i*, will be formed, at the distances determined by the construction of the instrument. These distances may be accurately preserved, provided that the teeth *a a* return when the ploughman comes back, after having ploughed one turn, in two of the channels formed before, marked *b b*: thus all the furrows in the field will be traced with the same regularity. When the ground is thus formed into drills, the pease may be scattered by a single motion of the hand at a certain distance from one another into the channels, and then covered with the flat part of a hand-rake, and pressed down gently. This instrument is so simple, that any workman may easily make or repair it.

On 2d Plate VII. is delineated a patent drill machine, lately invented by the Reverend James Cooke of Heaton-Norris near Manchester. A, the upper part of the seed-box. B, the lower part of the same box. C, a moveable partition, with a lever, by which the grain or seed is let fall at pleasure from the upper to the lower part of the seed-box, from whence it is taken up by cups or ladles applied to the cylinder D, and dropped into the funnel E, and conveyed thereby into the furrow or drill made in the land by the coulter F, and covered by the rake or harrow G. H, a lever, by which the wheel I is lifted out of gear with the wheel K, to prevent the grain or seed being scattered upon the ground, while the machine is turning round at the end of the land, by which the harrow G is also lifted from the ground at the same time, and by the same motion, by means of the crank, and the horizontal lever *h h*. L, a sliding lever, with a weight upon it, by means of which, the depth of the furrows or drills, and consequently the depth that the grain or seed will be deposited in the land, may be easily ascertained. M, a screw in the coulter beam, by turning of which, the seed-box B is elevated or depressed, in order to prevent the grain or seed being crushed or bruised by the revolution of the cups or ladles. Fig. 13. a rake with iron teeth, to be applied to the under side of the rails of the machine, with staples and screw nuts at *n n*, by which many useful purposes are answered, viz. in accumulating cutch or hay into rows, and as a scarificator for young crops of wheat in the spring, or to be used upon a fallow; in which case, the seed-box, the ladle cylinder, the coulter, the funnels, and harrows, are all taken away.

This side view of the machine is represented, for the sake of perspicuity, with one seed-box only, one coulter, one funnel, one harrow, &c. whereas a complete machine is furnished with five coulter, five harrows, seven funnels, a seed-box in eight partitions, &c. with ladles of different sizes, for different sorts of grain and seeds.

These machines (with five coulter sixteen guineas, with four coulter fifteen guineas), equally excel in setting or planting all sorts of grain and seeds, even carrot seed, to exactness, after the rate of from eight to ten chain acres per day, with one man, a boy, and two horses. They deposite the grain or seed in any given quantity from one peck to three bushels per acre, regularly and uniformly, and that without grinding or bruising the seed, and at any given depth, from half an inch to half a dozen inches, in rows at the distance of

Practice. twelve, sixteen, and twenty-four inches, or any other distance. They are equally useful on all lands, are durable, easy to manage, and by no means subject to be put out of repair.

The ladle cylinder D is furnished with cups or ladles of four different sizes for different sorts of grain or seeds, which may be distinguished by the numbers 1, 2, 3, 4.—N^o 1. (the smallest size) is calculated for turnip-feed, clover-feed, cole-feed, rape, &c. and will sow something more than one pound per statute acre. N^o 2. for wheat, rye, hemp, flax, &c. and will sow something more than one bushel per acre. N^o 3. for barley; and will sow one bushel and a half per acre. N^o 4. for beans, oats, pease, vetches, &c. and will sow two bushels per acre.

Notwithstanding the above specified quantities of grain or seeds, a greater or less quantity of each may be sown at pleasure, by stopping up with a little clay, or by adding a few ladles to each respective box. The grain or seeds intended to be sown, must be put in those boxes, to which the cups or ladles as above described respectively belong, an equal quantity into each box, and all the other boxes empty. The ladle cylinder may be reversed, or turned end for end at pleasure, for different sorts of grain, &c.

For sowing beans, oats, pease, &c. with a five-coulter machine, four large ladles must occasionally be applied at equal distances round those parts of the cylinder which subtend the two end boxes. And for sowing barley, eight large ones must be applied as above; or four ladles, N^o 2. to each of the wheat boxes. These additional ladles are fixed on the cylinder with nails, or taken off in a few minutes; but for sowing with a four-coulter machine, the above alterations are not necessary.

The funnels are applied to their respective places by corresponding numbers. Care should be taken, that the points of the funnel stand directly behind the backs of the coulters, which is done by wedges being applied to one side or other of the coulters, at the time they are fixed in their respective places.

The machine being thus put together, which is readily and expeditiously done, as no separate part will coincide with any other but that to which it respectively belongs, and an equal quantity of grain or seed in each of the respective boxes, the land also being previously ploughed and harrowed once or so in a place to level the surface; but if the land be very rough, a roller will best answer that purpose, whenever the land is dry enough to admit of it; and upon strong clays, a spiked roller is sometimes necessary to reduce the size of the large dry clods; which being done, the driver should walk down the furrow or edge of the land, and having hold of the last horse's head with his hand, he will readily keep him in such a direction, as will bring the outside coulter of the machine within three or four inches of the edges of the land or ridge, at which uniform extent, he should keep his arm till he comes to the end of the land; where having turned round, he must come to the other side of his horses, and walking upon the last outside drill, having hold of the horse's head with his hand as before, he will readily keep the machine in such a direction, as will strike the succeeding drill at such a distance from the last outside one, or that he walks upon, as the coulters are distant from each other.

Practice. The person who attends the machine should put down the lever H soon enough at the end of the land, that the cups or ladles may have time to fill, before he begins to sow; and at the end of the land, he must apply his right hand to the middle of the rail between the handles, by which he will keep the coulters in the ground, while he is lifting up the lever H with his left hand, to prevent the grain being scattered upon the headland, while the machine is turning round; this he will do with great ease, by continuing his right hand upon the rail between the handles, and applying his left arm under the left handle, in order to lift the coulters out of the ground while the machine is turning round.

If there be any difficulty in using the machine, it consists in driving it straight. As to the person who attends the machine, he cannot possibly commit any errors, except such as are wilful, particularly as he sees at one view the whole process of the business, viz. that the coulters make the drills of a proper depth; that the funnels continue open to convey the grain or seed into the drills; that the rakes or harrows cover the grain sufficiently; and when seed is wanting in the lower boxes B, which he cannot avoid seeing, he readily supplies them from the upper boxes A, by applying his hand, as the machine goes along, to the lever C. The lower boxes B, should not be suffered to become empty before they are supplied with seed, but should be kept nearly full, or within an inch or so of the edge of the box.

If chalk lines are made across the backs of the coulters, at such a distance from the ends as the seed should be deposited in the ground (viz. about two inches for wheat, and from two to three for spring corn), the person that attends the machine will be better able to ascertain the depth the seed should be deposited in the drills, by observing, as the machine goes along, whether the chalk lines are above or below the surface of the land; if above, a proper weight must be applied to the lever L, which will force the coulters into the ground; if below, the lever L and weight must be reversed, which will prevent their sinking too deep.

In different parts of the kingdom, lands or ridges are of different sizes; where the machine is too wide for the land, one or more funnels may occasionally be stopped with a little loose paper, and the seed received into such funnel returned at the end of the land, or sooner if required, into the upper seed-box. But for regularity and expedition, lands consisting of so many feet wide from outside to outside, as the machine contains coulters, when fixed at twelve inches distance, or twice or three times the number, &c. are best calculated for the machine. In wet soils or strong clays, lands or ridges of the width of the machine, and in dry soils, of twice the width, are recommended. For sowing of narrow high-ridged lands, the outside coulters should be let down, and the middle ones raised, so that the points of the coulters may form the same curve that the land or ridge forms. And the loose soil harrowed down into the furrows should be returned to the edges of the lands or ridges from whence it came, by a double mould-board or other plough, whether the land be wet or dry.

Clover or other lays, intended to be sown by the machine,

Practice.

machine, should be ploughed a deep strong furrow and well harrowed, in order to level the surface, and to get as much loose soil as possible for the coulter to work in; and when sown, if any of the seed appears in the drills uncovered by reason of the stiff texture of the soil, or toughness of the roots, a light harrow may be taken over the land, once in a place, which will effectually cover the seed, without displacing it at all in the drills. For sowing lays, a considerable weight must be applied to the lever L, to force the coulters into the ground; and a set of wrought-iron coulters, well-steel-ed, and made sharp at the front edge and bottom, are recommended; they will pervade the soil more readily, consequently require less draught, and expedite business more than adequate to the additional expence.

For every half acre of land intended to be sown by the machine with the seed of that very valuable root, (carrot) one bushel of saw-dust, and one pound of carrot seed, should be provided; the saw-dust should be made dry, and sifted to take out all the lumps and chips, and divided into eight equal parts or heaps; the carrot-seed should likewise be dried, and well rubbed between the hands, to take off the beards, so that it will separate readily, and being divided into eight equal parts or heaps, one part of the carrot-seed must be well mixed with one part of the saw-dust, and so on, till all the parts of carrot-seed and saw-dust are well mixed and incorporated together; in which state it may be sown very regularly in drills at twelve inches distance, by the cups or ladles N^o 2. Carrot-seed resembling saw-dust very much in its size, roughness, weight, adhesion, &c. will remain mixed as above during the sowing; a ladle-full of saw-dust will, upon an average, contain three or four carrot-seeds, by which means the carrot-seed cannot be otherwise than regular in the drills. In attempting to deposit small seeds near the surface, it may so happen that some of the seeds may not be covered with soil; in which case, a light roller may be drawn over the land after the seed is sown, which will not only cover the seeds, but will also, by levelling the surface, prepare the land for an earlier hoeing than could otherwise have taken place.

It has always been found troublesome, sometimes impracticable, to sow any kind of grain or seeds (even broad-cast) in a high wind. This inconvenience is entirely obviated, by placing a screen of any kind of cloth, or a sack, supported by two uprights nailed to the sides of the machine, behind the funnels, which will prevent the grain or seed being blown out of its direction in falling from the ladles into the funnels. Small pipes of tin may also be put on to the ends of the funnels, to convey the grain or seed so near the surface of the land, that the highest wind shall not be able to interrupt its descent into the drills.

Respecting the use of the machine, it is frequently remarked by some people not conversant with the properties of matter and motion, that the soil will close after the coulters, before the seed is admitted into the drills. Whereas the very contrary is the case; for the velocity of the coulters in passing thorough the soil, is so much greater than the velocity with which the soil closes up the drills by its own spontaneous gravity, that the incisions or drills will be constantly open for three or four inches behind the coulters; by which means, it is morally impossible (if the points of the funnels N^o 8.

stand directly behind the coulters) that the seed with the velocity it acquires in falling through the funnels, shall not be admitted into the drills. Practice.

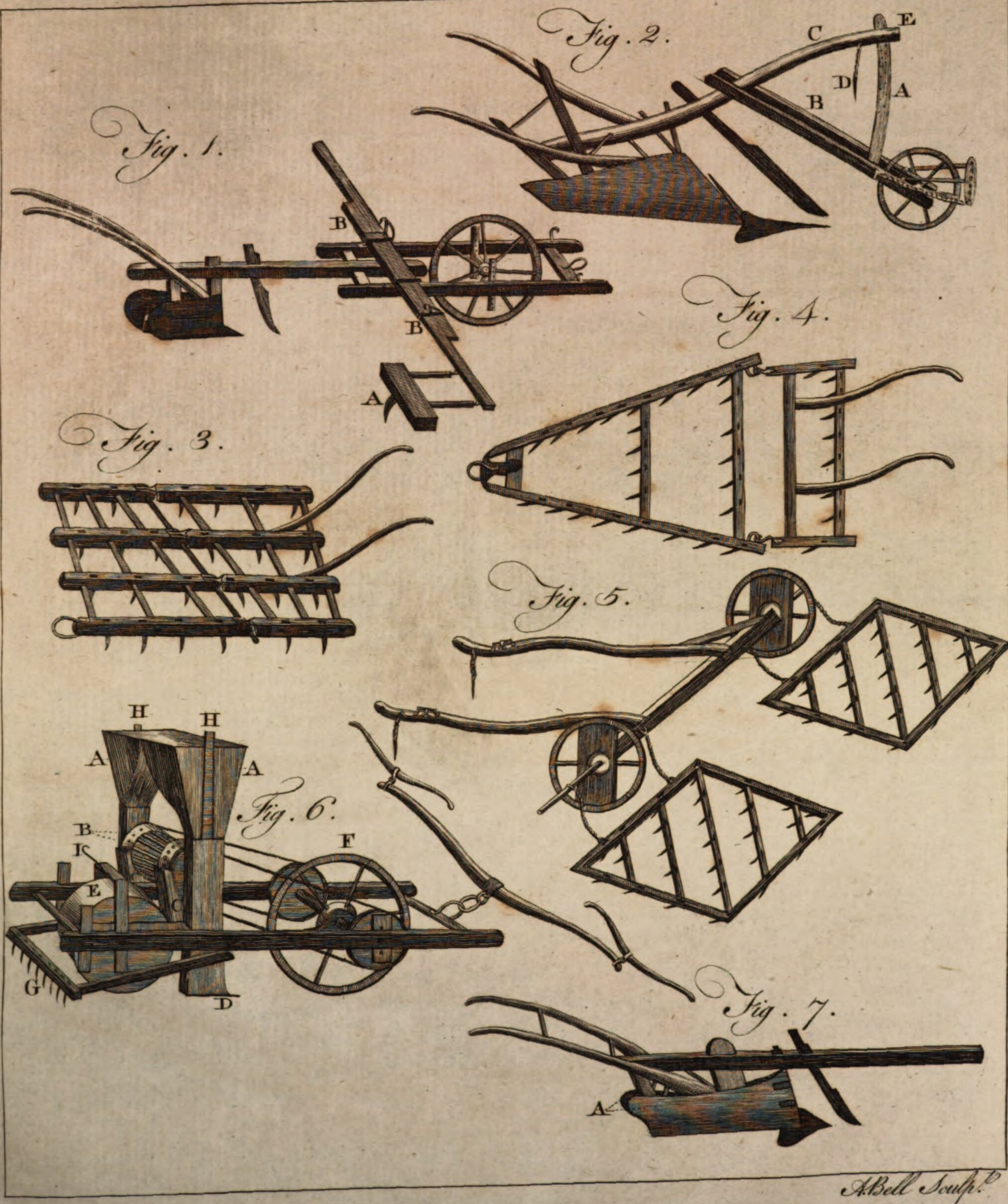
Fig. 12. is a new constructed simple hand-hoe, by which one man will effectually hoe two chain acres per day, earthing up the soil at the same time to the rows of corn or pulse, so as to cause roots to issue from the first joint of the stem, above the surface of the land, which otherwise would never have existed. 2d Plate VII

This hoe is worked much in the same manner as a common Dutch hoe, or scuffle, is worked in gardens. The handle is elevated or depressed, to suit the size of the person that works it, by means of an iron wedge being respectively applied to the upper or under side of the handle that goes into the socket of the hoe.

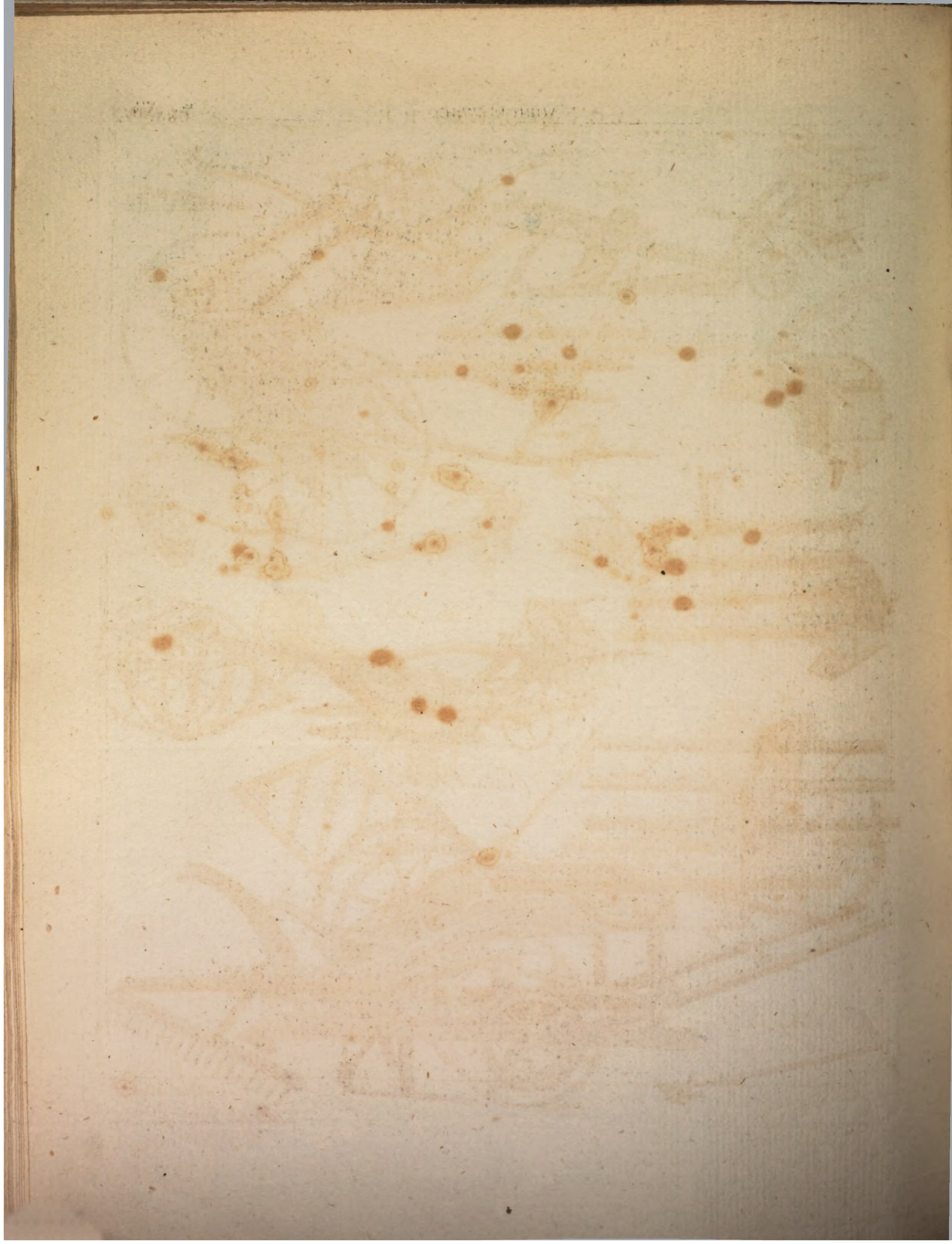
The wings or moulding plates of the hoe, which are calculated to earth up the soil to the rows of corn, so as to cause roots to issue from the first joint of the stem above the surface, which otherwise would not have existed, should never be used for the first hoeing, but should always be used for the last hoeing, and used or not used, at the option of the farmer, when any intermediate hoeing is performed.

SUMMARY of the OPERATIONS necessary in executing the NEW HUSBANDRY with the PLOUGH.

1. It is indispensably necessary that the farmer be provided with a drill and hoe-plough. Summary of the operations.
2. The new husbandry may be begun either with the winter or spring corn.
3. The land must be prepared by four good ploughings, given at different times, from the beginning of April to the middle of September.
4. These ploughings must be done in dry weather, to prevent the earth from kneading.
5. The land must be harrowed in the same manner as if it were sowed in the common way.
6. The rows of wheat should be sowed very straight.
7. When the field is not very large, a line must be strained across it, by which a rill may be traced with a hoe for the horse that draws the drill to go in; and when the rows are sown, 50 inches must be left betwixt each rill. But, when the field is large, stakes at five feet distance from each other must be placed at the two ends. The workman must then trace a small furrow with a plough that has no mold-board, for the horse to go in that draws the drill, directing himself with his eye by the stakes.
8. The sowing should be finished at the end of September, or beginning of October.
9. The furrows must be traced the long way of the land, that as little ground as possible may be lost in head-lands.
10. The rows, if it can be done, should run down the slope of the land, that the water may get the easier off.
11. The seed-wheat must be plunged into a tub of lime-water, and stirred, that the light corn may come to the surface and be skimmed off.
12. The seed must be next spread on a floor, and frequently stirred, till it is dry enough to run through the valves of the happer of the drill.
13. To prevent smut, the seed may be put into a ley of ashes and lime.
14. Good



A. Bell Sculp.



The Universal Sowing Machine.

Fig. 1.



Fig. 8.



Fig. 3.

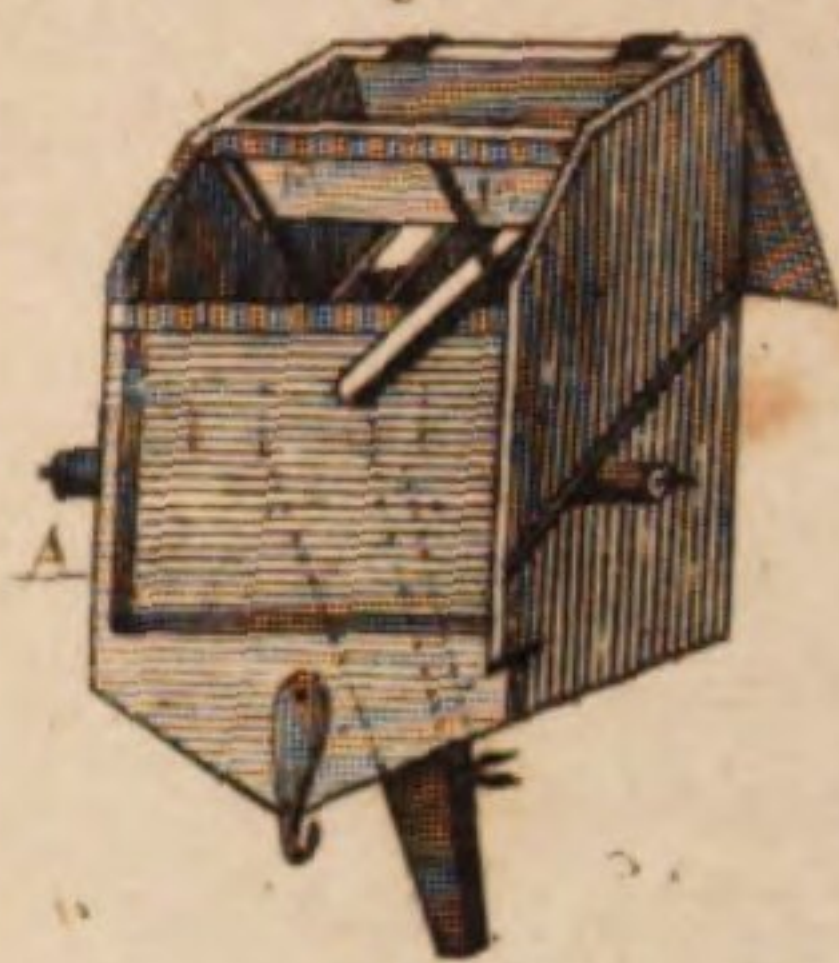


Fig. 2.

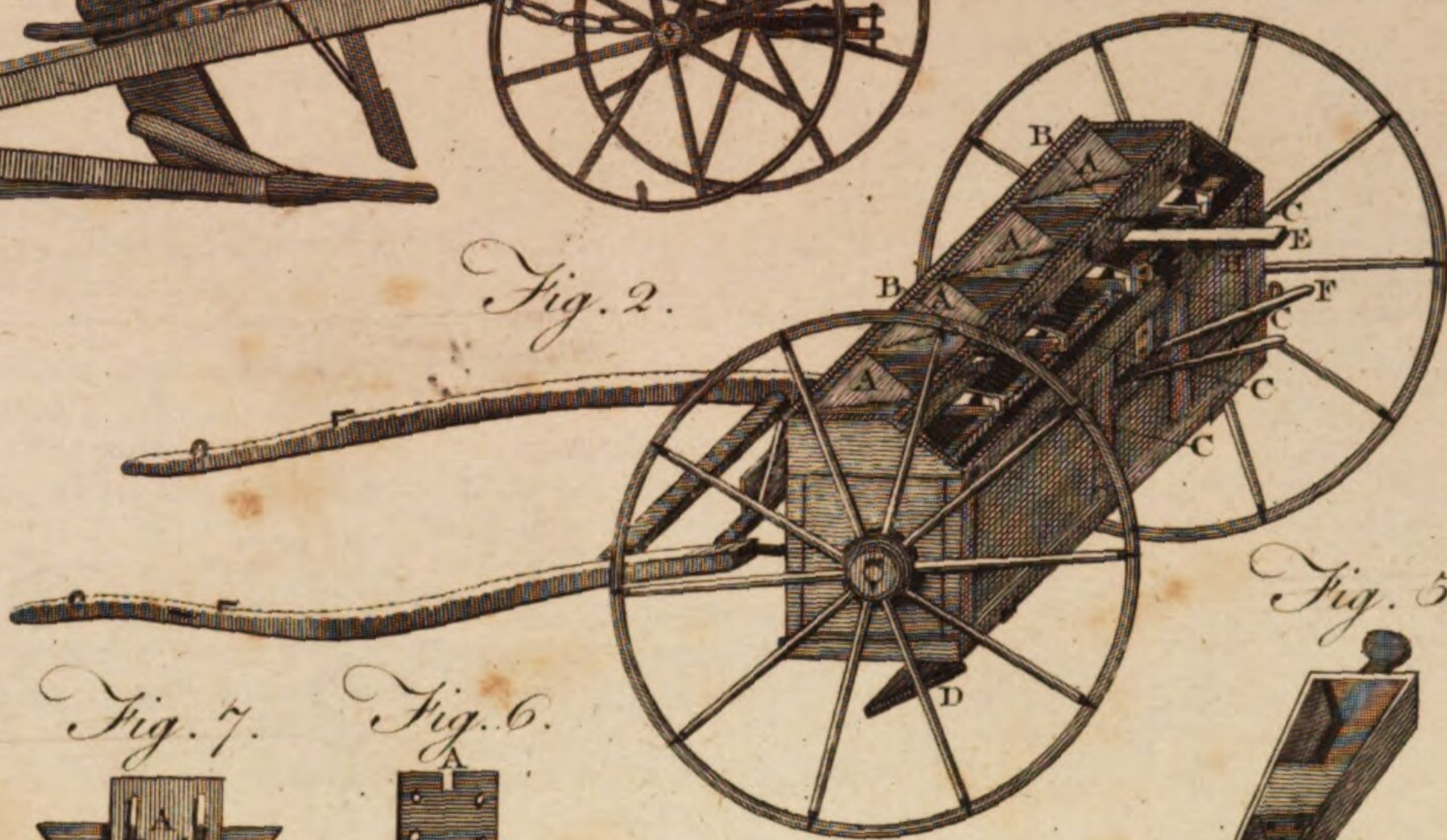


Fig. 10.



Fig. 7.



Fig. 6.



Fig. 5.



Fig. 4.

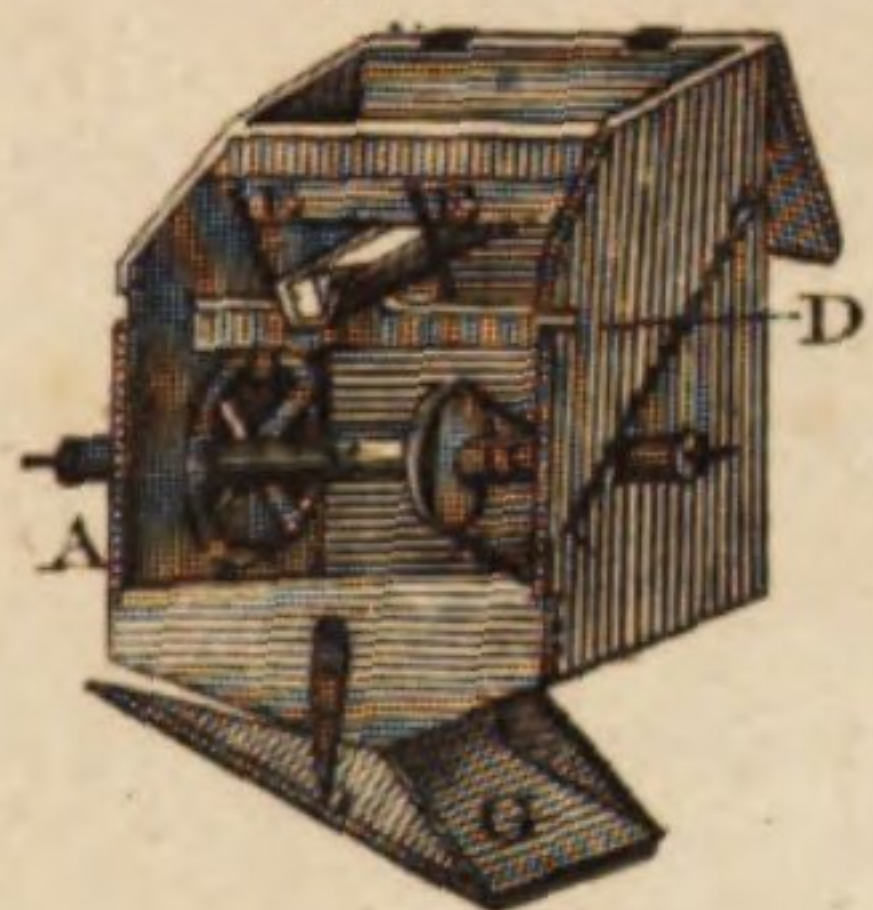


Fig. 11.

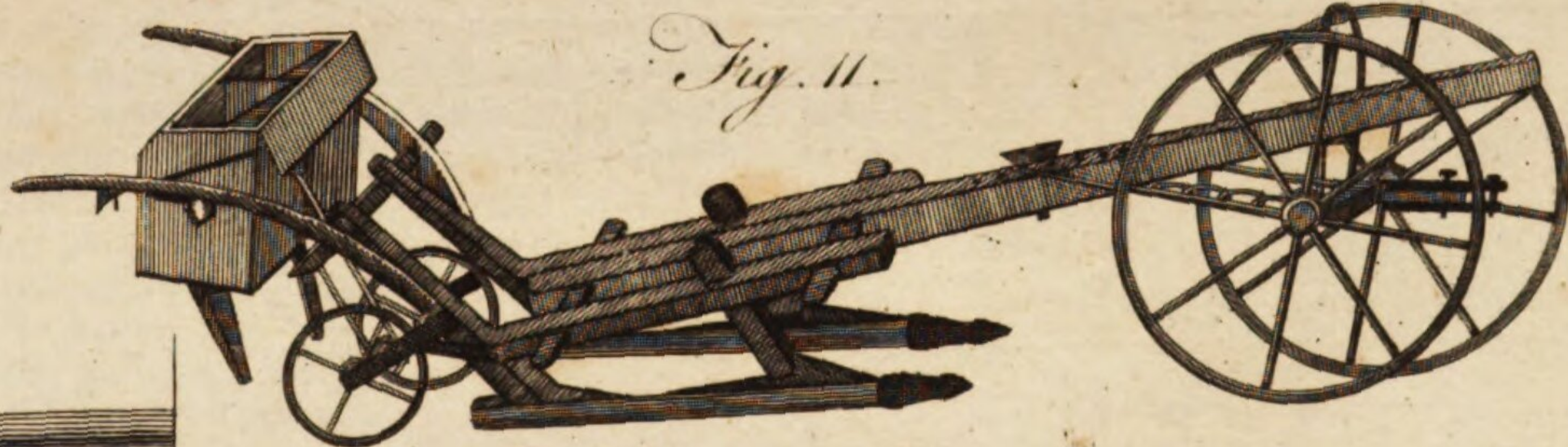


Fig. 9.

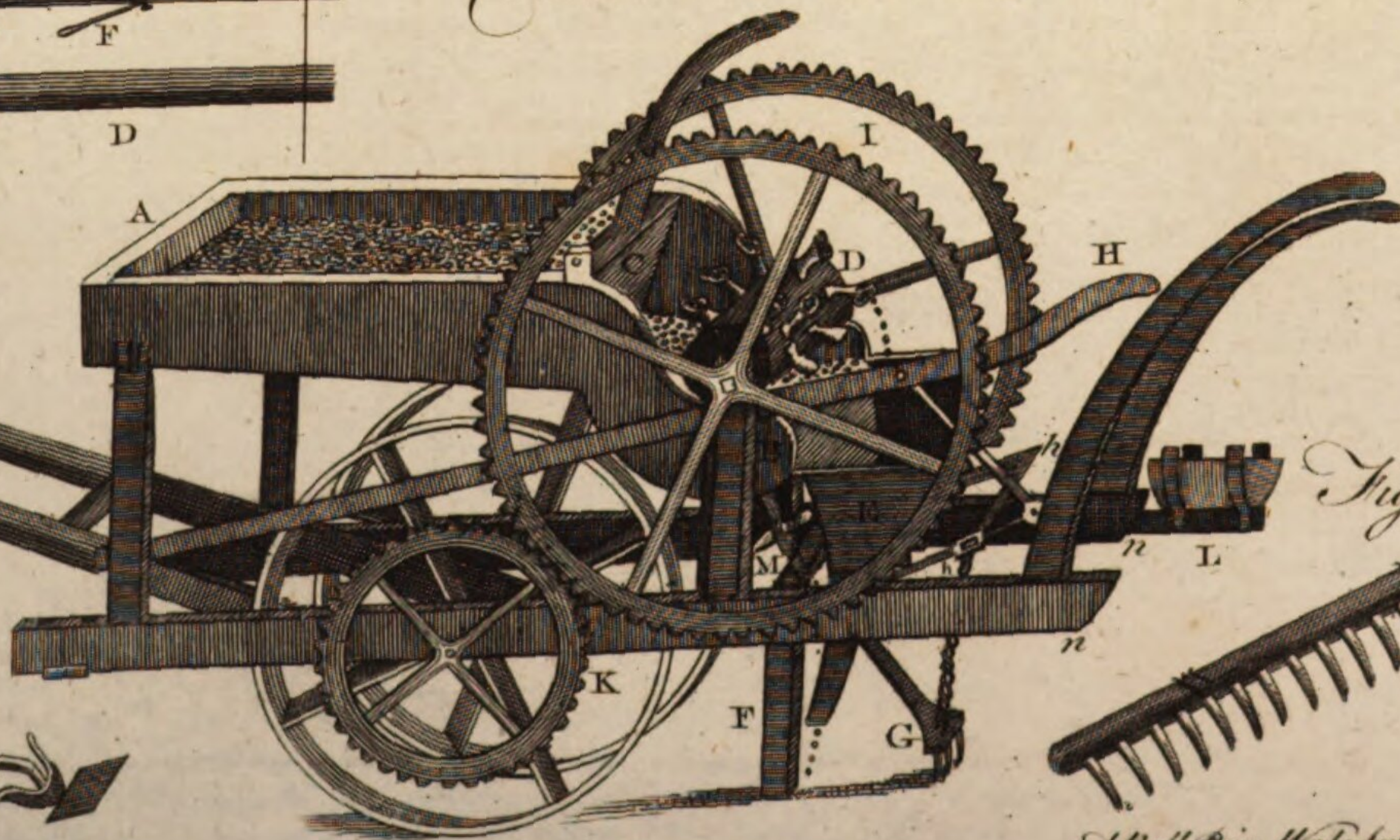
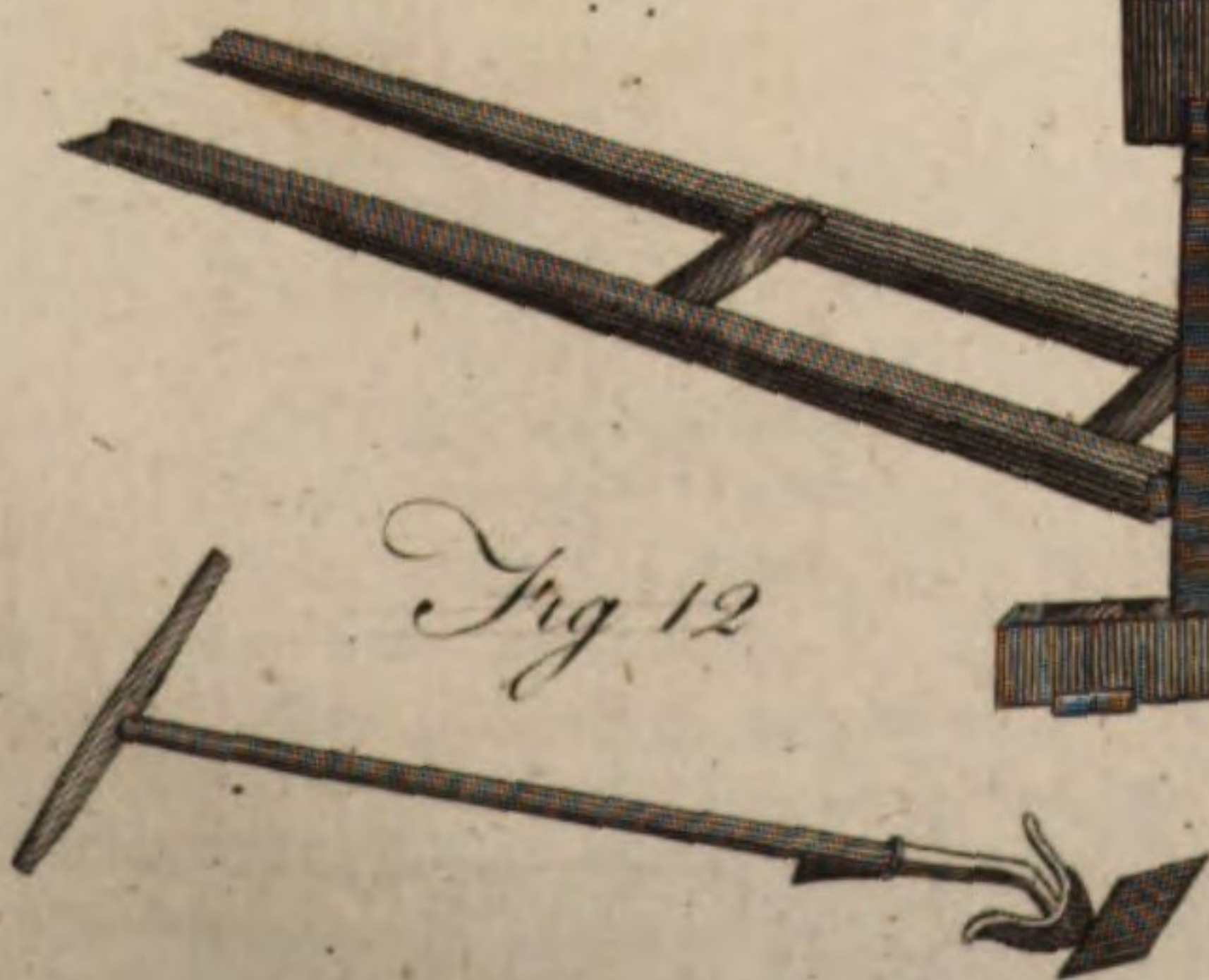


Cookes Drill Machine.

Fig. 13.



Fig. 12.



A Bell Prin. Wal. Sculptor fecit.

Practice. 14. Good old seed-wheat should be chosen in preference to new, as it is found by experience not to be so subject to smut.

15. After the hoppers of the drill are filled, the horse must go slowly along the furrow that was traced. That a proper quantity of seed may be sown, the aperture of the happer must be suited to the size of the grain.

16. As the drill is seldom well managed at first, the field should be examined after the corn has come up, and the deficiencies be supplied.

17. Upon wet soils or strong clays, wheat should not be deposited more than two inches deep, on any account whatever; nor less than two inches deep on dry soils. From two to three inches is a medium depth for all spring corn. But the exact depth at which grain should be deposited in different soils, from the lightest sand to the strongest clay, is readily ascertained only by observing at what distance under the surface of the land, the secondary or coronal roots are formed in the spring.

18. Stiff lands, that retain the wet, must be stirred or hoed in October. This should be done by opening a furrow in the middle of the intervals, and afterwards filling it up by a furrow drawn on each side, which will raise the earth in the middle of the intervals, and leave two small furrows next the rows, for draining off the water, which is very hurtful to wheat in winter.

19. The next stirring must be given about the end of March, with a light plough. In this stirring the furrows made to drain the rows must be filled up by earth from the middle of the intervals.

20. Some time in May, the rows must be evened; which, though troublesome at first, soon becomes easy, as the weeds are soon kept under by tillage.

21. In June, just before the wheat is in bloom, another stirring must be given with the plough. A deep furrow must be made in the middle of the intervals, and the earth thrown upon the sides of the rows.

22. When the wheat is ripe, particular care must be taken, in reaping it, to trample as little as possible on the ploughed land.

23. Soon after the wheat is carried off the field, the intervals must be turned up with the plough, to prepare them for the seed. The great furrow in the middle must not only be filled, but the earth raised as much as possible in the middle of the intervals.

24. In September, the land must be again sowed with a drill, as above directed.

25. In October, the stubble must be turned in for forming the new intervals; and the same management must be observed as directed in the first year.

We pretend not to determine whether the old or new husbandry be preferable in ever country. With regard to this point, the climate, the situation of particular land, skill and dexterity in managing the machinery, the comparative expence in raising crops, and many other circumstances, must be accurately attended to before a determination can be given.

The following comparative view of the old and new methods of culture, was furnished for the editors of Mr Tull's Horse-hoeing Husbandry, by a gentleman who for some years practised both in a country where the soil was light and chalky, like that from which he drew his ob-

VOL. I. Part I.

Practice. It is necessary to remark, that in the new husbandry every article is stated at its full value, and the crop of each year is four bushels short of the other; though, in several years experience, it has equalled and generally exceeded those of the neighbourhood in the old way.

“ An estimate of the expence and profit of 10 acres of land in 20 years.

I. In the old way.

			L.	s.	d.
First year, for wheat, costs 33l. 5s.					
viz.			L.	s.	d.
First ploughing, at 6s per acre	3	0	0		
Second and third ditto, at 8s.					
per acre	-	4	0	0	
Manure, 30s. per acre	-	15	0	0	
				22	0
Two harrowings, and sowing,					
at 2s. 6d. per acre	-	1	5	0	
Seed, three bushels per acre,					
at 4s. per bushel	-	6	0	0	
Weeding, at 2s. per acre		1	0	0	
Reaping, binding, and carrying,					
at 6s, per acre	-	3	0	0	
				11	5
Second year, for barley, costs					
11l. 6s. 8d. viz.					
Once ploughing, at 6s. per					
acre	-	3	0	0	
Harrowing and sowing, at					
1s. 6d. per acre	-	0	15	0	
Weeding, at 1s. per acre		0	10	0	
Seed, four bushels per acre,					
at 2s. per bushel	-	4	0	0	
Cutting, raking, and carrying,					
at 3s. 2d. per acre	-	1	11	8	
Grass-seeds, at 3s per acre		1	10	0	
				11	6
				44	11
Third and fourth years, lying in grass,					
cost nothing: so that the expence of					
ten acres in four years comes to 44l.					
11s. 8d. and in twenty years to				222	18
First year's produce is half a					
load of wheat per acre, at 7l.			35	0	0
Second year's produce is two					
quarters of barley per acre,					
at 1l.			20	0	0
Third and fourth years grass					
is valued at 1l. 10s. per acre			15	0	0
So that the produce of ten					
acres in four years is			70	0	0
And in twenty years it will be			350	0	0
Deduct the expence, and there remains					
clear profit on ten acres in twenty years					
by the old way				127	1

223
Comparative view of the expence and profits of the Old and New Husbandry.

II. In the new way.

First year's extraordinary expence is, for ploughing and manuring the land, the same as in the old way, L. 22 0 0

S f

Ploughing

Practice.

L. s. d. L. s. d.

Ploughing once more, at 4s. per acre	2	0	0
Seed, nine gallons per acre, at 4s. per bushel	2	5	0
Drilling, at 7d. per acre	0	5	10
Hand-hoeing and weeding, at 2s. 6d. per acre	1	5	0
Horse-hoeing six times, at 10s. per acre	5	0	0
Reaping, binding, and carrying, at 6s per acre	3	0	0
The standing annual charge on ten acres is	13	15	10

Therefore the expence on ten acres in twenty years is	275	16	8
Add the extraordinaries of the first year, and the sum is	297	16	8
The yearly produce is at least two quarters of wheat per acre, at 11. 8s. per quarter; which, on ten acres in twenty years, amounts to	560	0	0
Therefore, all things paid, there remains clear profit on ten acres in twenty years by the new way	262	3	4

224
Arguments
in favour of
the New
Method.

"So that the profit on ten acres of land in twenty years, in the new way, exceeds that in the old by L. 135 : 1 : 8, and consequently is considerably more than double thereof; an ample encouragement to practise a scheme, whereby so great advantage will arise from so small a quantity of land, in the compass of a twenty-one years lease; one year being allowed, both in the old and new way, for preparing the ground.

"It ought withal to be observed, that Mr Tull's husbandry requires no manure at all, though we have here, to prevent objections, allowed the charge thereof for the first year; and moreover, that though the crop of wheat from the drill-plough is here put only at two quarters on an acre, yet Mr Tull himself, by actual experiment and measure, found the produce of his drilled wheat-crop amounted to almost four quarters on an acre."

It appears also from a comparative calculation of expence and profit between the drill and common husbandry, taken from Mr Baker's report to the Dublin Society of his experiments in agriculture for the year 1765, that there is a clear profit arising upon an Irish acre of land in 15 years in the drill husbandry of L. 52 : 3 : 11, and in the common husbandry of L. 27 : 19 : 2; and therefore a greater profit in the drilled acre in this time of L. 24 : 4 : 9, which amounts to L. 1 : 12 : 3 $\frac{1}{4}$ per annum. From hence he infers, that in every 15 years the fee-simple of all the tillage-lands of the kingdom is lost to the community by the common course of tillage. In stating the accounts, from which their result is obtained, no notice is taken of fences, water cutting the land, weeding and reaping, because these articles depend on a variety of circumstances, and will, in general, exceed in the common husbandry those incurred by the other.

Besides, the certainty of a crop is greater in this new way than in the old way of sowing; for most of the

accidents attending wheat crops, are owing to their being late sown, which is necessary to the farmer in the old way; but in the horse-hoeing method the farmer may plough two furrows whereon the next crop is to stand immediately after the first crop is off. In this manner of husbandry, the land may be ploughed dry and drilled wet, without any inconvenience; and the seed is never planted under the furrow, but placed just at the depth which is most proper, that is, at about two inches; in which case it is easy to preserve it, and there is no danger of burying it. Thus the seed has all the advantage of early sowing, and none of the disadvantages that may attend it in the other way, and the crop is much more certain than by any other means that can be used.

The condition in which the land is left after the crop, is no less in favour of the horse-hoeing husbandry than all the other articles. The number of plants is the great principle of the exhausting of land. In the common husbandry, the number is vastly greater than in the drilling way, and three plants in four often come to nothing, after having exhausted the ground as much as profitable plants; and the weeds which live to the time of harvest in the common way, exhaust the land no less than so many plants of corn, often much more. The horse-hoeing method destroys all the weeds in the far greater part of the land, and leaves that part unexhausted and perfectly fresh for another crop. The wheat plants being also but a third part of the number at the utmost of those in the sowing way, the land is so much the less exhausted by them; and it is very evident from the whole, that it must be, as experience proves that it is, left in a much better condition after this than after the common husbandry.

The farmers who are against this method object, that it makes the plants too strong, and that they are more liable to the blacks or blights of insects for that reason; but as this allows that the hoeing can, without the use of dung, give too much nourishment, it is very plain that it can give enough; and it is the farmer's fault if he do not proportion his pains so as to have the advantage of the nourishment without the disadvantages. It is also objected, that as hoeing can make poor land rich enough to bear good crops of wheat, it may make good land too rich for it. But if this should happen, the sowing of wheat on it may be let alone a while, and in the place of it the farmer may have a crop of turnips, carrots, cabbages, and the like, which are excellent food for cattle, and cannot be over-nourished: or, if this is not chosen, the land, when thus made too rich, may soon be sufficiently impoverished by sowing corn upon it in the common old way.

The method of horse-hoeing husbandry, so strongly recommended by Mr Tull, is objected to by many on account of the largeness of the intervals which are to be left behind the rows of corn. These are required to be about five feet wide; and it is thought that such wide spaces are so much lost earth, and that the crop is to be so much the less for it. But it is to be observed, that the rows of corn separated by these intervals need not be single; they may be double, triple, or quadruple, at the pleasure of the farmer; and four rows thus standing as one will have the five feet interval but one-fourth of its bigness as to the whole quantity, and it will be but as fifteen inch intervals to plants

225

Objections
and answers.

in

Practice. in single rows. Corn that is sown irregularly in the common way, seems indeed to cover the ground better than that in rows: but this is a mere *deceptio visus*; for the stalks of corn are never so thick as when they come out of one plant, or as when they stand in a row; and a horse-hoed plant of corn will have 20 or 30 stalks in a piece of ground of the same quantity, where an unhoed plant will have only two or three stalks. If these stalks of the hoed plant were separated and planted over the intervals, the whole land would be better covered than it is in the common way; and the truth is, that though these hoed fields seem to contain a much less crop than the common sown fields, yet they in reality do contain a much greater. It is only the different placing that makes the sown crop seem the larger, and even this is only while both crops are young.

The intervals are not lost ground, as is usually supposed, but when well horse-hoed they are all employed in the nourishment of the crop; the roots of the plants in the adjoining rows spreading themselves thro' the whole interval, and drawing such nourishment from it, that they increase accordingly. When the plants stand in the scattered way, as in common sowing, they are too close to one another; each robs its neighbours of part of their nourishment, and consequently the earth is soon exhausted, and all the plants half starved. The close standing of them also prevents the benefit of after-tilling, as the hoe cannot be brought in, nor the ground by any means stirred between them to give it a new breaking, and consequently afford them new food.

Experiments have abundantly proved, that in large grounds of wheat where the different methods have been tried, those parts where the intervals were largest have produced the greatest crops, and those where hoeing was used without dung have been much richer than those where dung was used without hoeing. If it were possible that plants could stand as thick, and thrive as well over the whole surface of the ground, as they do in the rows separated by these large intervals, the crops of corn so produced would be vastly greater than any that have been heard of; but the truth is, that plants receive their growth not according to the ground they stand on, but to the ground they can extend their roots into; and therefore a single row may contain more plants than a large interval can nourish, and therefore the same number that stand in that row, and no more than these, could be nourished, if scattered over the whole interval: and they would be much worse nourished in that way; because while the interval is void, the earth may be stirred about them, and new roots will be formed in great numbers from every one broken by the instruments, and new nourishment laid before these roots by the breaking the particles of earth, by which the plants will have supplies that they cannot have when scattered over the whole surface, because the ground is then all occupied, and cannot be moved between the plants.

226
In what
circum-
stance the
new me-
thod is less
proper.

All soils and all situations are not equally proper for this method of planting in rows, with large intervals and hoeing between. The lightest soils seem to be best for it, and the tough and wet clays the worst. Such grounds as lie on the sides of hills are also less proper than others for this work.

This method is not so proper in common fields, but

that not in respect of the soil, but of the husbandry of the owners, who are usually in the old way, and change the species of corn, and make it necessary to fallow every second, third, or fourth year. Nevertheless it has been found by later experiments, that the intervals betwixt the rows of plants, as recommended by Mr Tull, were too great, perhaps double of what they should be in the most profitable method of culture; by which means much less crops are obtained than might be produced at nearly the same expence. This has rendered the profits of the drill method much less than they would have been in a more judicious practice, and, consequently, has proved a great disadvantage to it in comparison with the broad-cast. Mr Tull was led into this, partly from the want of more perfect instruments for hoeing, and of ploughs proper for drilling.

To the preceding statements, the following observations by Sir John Anstruther, published among the Select Papers of the Bath Society, may not be improperly subjoined.

227
The slow progress which the Drill-husbandry has made in many parts of Great Britain since Mr Tull's time, he observes, has been principally owing to the want of proper drill-ploughs. Before drilling can become general, those ploughs must be simple, such as a common ploughman accustomed to use strong instruments can use without breaking, and such also as common workmen can easily make or repair. Mathematical accuracy he considers as not required for delivering the seed: for it matters very little whether there be a quarter of a peck more or less sown, if it be delivered with tolerable regularity. He therefore had a plough made, according to his own directions, by a common plough-wright, of sufficient strength for any land made fit for turnips or wheat. It was tried on very rough ground unfit for sowing, in order to ascertain its strength; and it had been used for eight years without its needing any repair. It is a double drill-plough, which sows two ridges at a time, the horse going in the furrow between them, and of course does not tread upon the ground intended to be sown; which with a single drill must be the case, and does much harm by the horses feet sinking and making holes in the fine ground, which retain the water, and hurt the wheat when young.

He proceeds to observe, "That having read Mr Forbes upon the extensive practice of the new husbandry, and some other authors, who gave a more clear and distinct account of the different operations in drilling than had heretofore been given, I wished to try them, and to adapt my plough to sow the quantities therein directed. It was, however, adjusted to sow a smaller quantity, and the seed was not steeped.

"Not having ground so proper as I wished, it was drilled on the side of a field, the soil of which was light and sandy, and in such bad order, that the preceding crop was a very indifferent one. It was therefore manured with a compost dung-hill.

"After cross-ploughing and manuring, it was laid into four and a half feet ridges, then harrowed and drilled with one peck and a half of wheat on an acre and a quarter, which is nearly one peck and a fifth per English acre. It was drilled the 27th of October, and rolled after drilling. The crop was late in its appearance, and very backward in the spring.

S f 2

"March

Practice.

" March 31st, it was horse-hoed one furrow *from* the rows.

" April 8th, it was hand-hoed and weeded in the rows.

" 25th, horse-hoed again, laying a furrow back *to* the rows.

" May 15th, hand-hoed the second time.

" June 2d, horse-hoed *from* the rows.

" June 12th, hand-hoed the third time.

" July 14th, horse-hoed *to* the rows.

" At this last hoeing, as many of the ears were beaten down into the intervals by wind and rain, a man went before the horse-hoe, and turned the ears back into their proper place.

" The crop, when reaped and threshed, yielded me 36 bushels on one acre and a quarter, which is 28 bushels and three pecks per acre; and the produce from one peck and half 96 for one.

" As the produce appeared so great, from land in such bad order, it was carefully measured again, and found to be right. But this increase, though great, was not so large as Mr Craik of Glasgow had without dung.

" Mr Randal says, 'It is an experimented fact, that on a fine loam exquisitely prepared, 144 bushels have been produced from one acre. And, I believe, it is not known what the increase may be brought to in rich lands by high cultivation.'

" Some years since, I had beans dropt alternately with potatoes, at two feet distance in the rows, which were three feet apart, and ploughed in the intervals. The land adjoining was sown with beans and pease, which were a good crop; but those sown among the potatoes a better one. I pulled one stem of the beans planted with the potatoes, which had three branches rising from the bottom, and it produced 225 beans. In all the trials of drilled beans, most of the stems had two branches, with many pods upon each.—From these and other instances, I believe it is not yet known to what increase grain may be brought by drilling, good cultivation, and manure.

" Horse-hoeing is certainly preferable to close drilling or hand-hoeing; but the latter is superior to broadcast.

" Horse-hoeing the full depth increases the crop, by making it tiller or branch more than it otherwise would do; and the advantage is distinctly observable every hoeing, by the colour of the grain. It prepares the ground for the next crop, at the same time that it increases the crop growing, which hand-hoeing does not, although it may destroy the weeds. Thus drilled ground is kept in a loose open state to receive the benefit of the influence of the air and weather, which broadcast has not; and it is evident, from certain experience, that crops may be drilled many years to good advantage without manure.

" Suppose the crops only 20 bushels per acre, what course of broadcast crops will give 5 l. an acre for the course? But suppose they are dunged the same as any ground in the most approved course, there is the greatest reason to expect as much as in the above experiment, which is 28 and three-quarters, and at 5s. per bushel amounts to 7l. 3s. 9d.

" Calculations may be of service to those who wish to try drilling, and have few books to direct them.

Practice.

" One acre is 10 chains long, of 660 feet, or 220 yards long, and one yard broad, containing 4840 square yards. Then if the ridge is four feet six inches, this makes 14 ridges and three feet to spare. This length of 220 yards, multiplied by 14 (the number of ridges) gives a length of yards 3080, to which add 146 for the spare three feet, and it will be 3226 yards. And as two rows are drilled on a ridge, the number of rows will be in length 6452 yards; but as a deduction of 172 yards must be made for the head ridges, suppose three yards each, &c. the whole length to be sown will be 6280 yards clear. Now a gallon (Winchester) holds about 80,000 grains. The quantity recommended to be drilled by Mr Forbes and others, being six gallons, or two-thirds of a bushel per acre, is nearly 78 grains to a yard, or 26 to a foot. But in my experiment, by this calculation, it was only about 11 grains to a foot; which is quite sufficient, if the seed be good, and it be not destroyed by vermin.

" Now with regard to the quantity of land this drill-plough may sow; if a horse walks at the rate of two miles per hour, he goes 16 miles in eight hours, or 28,460 yards. As he sows two ridges at once, this is seven lengths and two-thirds per acre, or 1686 yards to sow an acre, being nearly 17 acres in a day.

" Four horse-hoeings are calculated equal to two ploughings. In plain ploughing they suppose the ridge is ploughed with four furrows, or eight for twice ploughing. The four horse-hoeings are eight furrows, equal to two ploughings.

" Mr Tull directs four hoeings, and Mr Forbes five. First, in November, when the plant has four blades. 2dly, In March, deep, and nearer the rows than the former; both these hoeings should be *from* the rows. 3dly, Hand-hoed when it begins to spindle, if the earth be crumbly, *to* the rows. 4thly, When it begins to blossom, *from* the rows, but as near to them as in the second hoeing. 5thly, When done blossoming, to ripen and fill the grain, *to* the rows.

" The last hoeing Mr Tull does not direct, but Mr Forbes advises it, as being of essential service in filling the grain, and saving trouble in making the next seed-furrows. They advise the patent or sowing-plough for horse-hoeing; and the expence is calculated by Mr Craik at one guinea per acre, reaping included.

" But let us suppose the following, which are the prices in the county I live in (Fife).

	L.	s.	d.
Ploughing to form the ridges,	-	0	4 0
Harrowing,	-	0	0 4
Four hoeings, equal to two ploughings,	-	0	8 0
Sowing,	-	0	0 4
Hand-hoeing twice,	-	0	8 0
Seed, one peck and a half, at 5s. a bushel,	-	0	1 10

Whole expence per acre, L. 1 2 6

Drill-husbandry is, as a good writer has justly defined it, "*the practice of a garden brought into the field.*" Every man of the least reflection must be sensible, that the practice of the garden is much *better* than that of the field, only a little more expensive; but if (as is the case) this extra expence be generally much more than repaid by the superior goodness and value of drilled crops, it ought to have no weight in comparing the two modes of husbandry.

In

Practice.

In the broadcast method the land is often sown in bad tilth, and always scattered at random, sometimes by very unskilful hands. In drilling, the land must be in fine order; the seed is set in trenches drawn regularly, all of nearly an equal depth, and that depth suited to the nature of each kind of seed. These seeds are also distributed at proper distances, and by being equally and speedily covered, are protected from vermin and other injuries; so that the practice of the garden is here exactly introduced into the field.

In the broadcast method the seed falls in some places too thick, in others too thin; and being imperfectly covered, a part of it is devoured by vermin which follow the sower; another part is left exposed to rain or frost, or to heats, which greatly injure it. When harrowed, a great part of it (small seeds especially) is buried so deep, that if the soil be wet, it perishes before it can vegetate.

Again: When thus sown, there is no meddling with the crop afterwards, because its growth is irregular. The soil cannot be broken to give it more nourishment, nor can even the weeds be destroyed without much inconvenience and injury.

But in the drill-husbandry the intervals between the rows, whether double or single, may be horse-hoed; and thereby nourishment may repeatedly be given to the plants, and the weeds almost totally destroyed.

The very same effects which digging has upon young shrubs and trees in a garden, will result from horse-hoeing in a field, whether the crop be corn or pulse: For the reason of the thing is the same in both cases, and being founded in nature and fact, cannot ever fail. In drilling, no more plants are raised on the soil than it can well support; and by dividing and breaking the ground they have the full advantage of all its fertility.

The plough prepares the land for a crop, but goes no further; for in the broadcast husbandry it cannot be used: but the crop receives greater benefit from the tillage of the land by the horse-hoe, while it is growing, than it could in the preparation. No care in tilling the land previous to sowing can prevent weeds rising with the crop; and if these weeds be not destroyed while the crop is growing, they will greatly injure it. In the broadcast husbandry this cannot be done; but in drilling, the horse-hoe will effect it easily.

And what adds to the farmer's misfortune is, that the most pernicious weeds have seeds winged with down, which are carried by the wind to great distances; such as thistles, sow-thistles, colts-foot, and some others.

If the expence of horse-hoeing be objected, there are two answers which may very properly be made: The first is, that this expence is much less than that of hand-hoeing were it practicable, or of hand-weeding. The second is, that it is more than repaid by the quantity of seed saved by drilling; to say nothing of the extra quantity and goodness of the crops, which are generally self-evident.

Upon the whole: If the particular modes of cultivating land by the new husbandry should, after all, be considered as perhaps too limited to be universally adopted; yet it has been of great use in raising suspicions concerning the old method, and in turning the views of philosophers and farmers towards improving in general. Many real improvements in agriculture have been the consequences of these suspicions; and as this spirit of inquiry remains in full vigour, a solid foundation is laid for expecting still further improvements in this useful art.

Practice.

A G R

AGRIFOLIUM, or AQUIFOLIUM. See ILEX.

AGRIGENTUM (anc. geog.), a city of Sicily, part of the site of which is now occupied by a town called *Girgenti* from the old name. See GIRGENTI.

According to ancient authors, Dedalus, the most famous mechanician of fabulous antiquity, fled to this spot for protection against Minos, and built many wonderful edifices for Cocalus king of the island. Long after his flight, the people of Gela sent a colony hither 600 years before the birth of Christ; and from the name of a neighbouring stream called the new city *Acragas*, whence the Romans formed their word *Agrigentum*. These Greeks converted the ancient abode of the Siculi into a citadel to guard the magnificent city, which they erected on the hillocks below.

An advantageous situation, a free government with all its happy effects, and an active commercial spirit, exalted their commonwealth to a degree of riches and power unknown to the other Greek settlements, Syracuse alone excepted. But the prosperity of Agrigentum appears to have been but of short duration, and tyranny soon destroyed its liberties.

Phalaris was the first that reduced it to slavery. His name is familiar to most readers on account of his cruelty, and the brazen bull in which he tortured his enemies: (See PHALARIS.)—Phalaris met with the

A G R

common fate of tyrants, and after his death the Agrigentines enjoyed their liberty for 150 years; at the expiration of which term Thero usurped the sovereign authority. The moderation, justice, and valour of this prince preserved him from opposition while living, and have rescued his memory from the obloquy of posterity. He joined his son-in-law Gelo, king of Syracuse, in a war against the Carthaginians; in the course of which victory attended all his steps, and Sicily saw herself for a time delivered from her African oppressions. Soon after his decease, his son Thrasydeus was despoiled of the diadem, and Agrigentum restored to her old democratical government. Ducetius next disturbed the general tranquillity. He was a chief of the mountaineers, descendants of the Siculi; and was an overmatch for the Agrigentines while they were unsupported by alliances, but sank under the weight of their union with the Syracusans. Some trifling alterations dissolved this union, and produced a war, in which the Agrigentines were worsted; and compelled to submit to humiliating terms of peace. Resentment led them to embrace with joy the proposals of the Athenians, then meditating an attack upon Syracuse. Their new friends soon made them feel that the sacrifice of liberty and fortune would be the price of their protection; and this consideration brought them speedily

Agrigen-
tum.

speedily back to their old connections. But as if it had been decreed that all friendship should be fatal to their repose, the reconciliation and its effects drew upon them the anger of the Carthaginians. By this enemy their armies were routed, their city taken, their race almost extirpated, and scarce a vestige of magnificence was left. Agrigentum lay 50 years buried under its own ruins; when Timoleon, after triumphing over the Carthaginians, and restoring liberty to Sicily, collected the descendants of the Agrigentines, and sent them to re-establish the dwellings of their forefathers. Their exertions were rewarded with astonishing success; for Agrigentum rose from its ashes with such a renewal of vigour, that in a very short time we find it engaged in the bold scheme of seizing a lucky moment, when Agathocles and Carthage had reduced Syracuse to the lowest ebb, and arrogating to itself supremacy over all the Sicilian republics. Xenodocus was appointed the leader of this arduous enterprise; and had his latter operations been as fortunate as his first campaign, Agrigentum would have acquired such a preponderance of reputation and power, that the rival states would not even have dared to attack it. But a few brilliant exploits were succeeded by a severe overthrow; the Agrigentines lost courage, disagreed in council, and humbly sued for peace to Agathocles. This commonwealth afterwards took a strong part with Pyrrhus; and when he left Sicily to the mercy of her enemies, threw itself into the arms of Carthage. During the first Punic war Agrigentum was the head-quarters of the Carthaginians, and was besieged by the Roman consuls, who after eight months blockade took it by storm. It nevertheless changed masters several times during the contest between these rival states, and in every instance suffered most cruel outrages. After this period very little mention of it occurs in history, nor do we know the precise time of the destruction of the old city and the building of the new one. See GIRGENTI.

The principal part of the ancient city lay in the vale; the present town, called *Girgenti*, occupies the mountain on which the citadel of Cocalus stood.

It was difficult to be more judicious and fortunate in the choice of situation for a large city. The inhabitants were here provided with every requisite for defence, pleasure, and comfort of life; a natural wall, formed by abrupt rocks, presented a strong barrier against assailants; pleasant hills sheltered them on three sides without impeding the circulation of air; before them a broad plain watered by the Acragas, gave admittance to the sea-breeze, and to a noble prospect of that awful element; the port or emporium lay in view at the mouth of the river, and probably the road across the flat was lined with gay and populous suburbs.

The hospitality and parade for which the Agrigentines are celebrated in history were supported by an extensive commerce; by means of which, the commonwealth was able to resist many shocks of adversity, and always to rise again with fresh splendour. It was, however, crushed by the general fall of Grecian liberty; the feeble remnants of its population, which had survived so many calamities, were at length driven out of its walls by the Saracens, and obliged to lock them-

selves up for safety among the bleak and inaccessible rocks of the present city.

Agrigen-
tum.

At the north-east angle of the ancient limits, upon some foundations of large regular stones, a church has been erected; a road appears hewn in the solid rock for the convenience of the votaries that visited this temple in ancient days. It was then dedicated to Ceres and her daughter Proserpine, the peculiar patronesses of Sicily. Bishop Blaize has succeeded to their honours.

At the south-east corner, where the ground, rising gradually, ends in a bold eminence, which is crowned with majestic columns, are the ruins of a temple said to have been consecrated to Juno. To the west of this stands the building commonly called the *Temple of Concord*; the stone of which, and the other buildings, is the same as that of the neighbouring mountains and cliffs, a conglutination of sea-sand and shells, full of perforations, of a hard and durable texture, and a deep reddish brown colour. This Doric temple has all its columns, entablature, pediments, and walls entire; only part of the roof is wanting. It owes its preservation to the piety of some Christians, who have covered half the nave, and converted it into a church consecrated under the invocation of St Gregory bishop of Girgenti.

Proceeding in the same direction, you walk between rows of sepulchres cut in the rock wherever it admitted of being excavated by the hand of man, or was so already by that of nature. Some masses of it are hewn into the shape of coffins; others drilled full of small square holes employed in a different mode of interment, and serving as receptacles of urns. One ponderous piece of the rock lies in an extraordinary position; by the failure of its foundation, or the shock of an earthquake, it has been loosened from the general quarry, and rolled down the declivity, where it now remains supine with the cavities turned upwards. Only a single column marks the confused heap of moss-grown ruins belonging to the temple of Hercules. It stood on a projecting rock above a chasm in the ridge, which was cut through for a passage to the emporium.

In the same tract, over some hills, is situated the building usually called the *Tomb of Thero*. It is surrounded by aged olive-trees, which cast a wild irregular shade over the ruin. The edifice inclines to the pyramidal shape, and consists at present of a triple plinth, and a base supporting a square pedestal: upon this plain solid foundation is raised a second order, having a window in each front, and at each angle two Ionic pilasters crowned with an entablature of the Doric order. Its inside is divided into a vault, a ground room, and one in the Ionic story, communicating with each other by means of a small internal staircase.

In the plain are seen the fragments of the temple of Esculapius; part of two columns and two pilasters, with an intermediate wall, support the end of a farmhouse, and were probably the front of the cella. Pursuing the track of the walls towards the west, you arrive at a spot which is covered with the gigantic remains of the temple of Jupiter the Olympian, minutely described by Diodorus Siculus. It may literally be said that it has not one stone left upon another; and it is barely possible, with the help of much conjecture, to discover the traces of its plan and dimensions. Di-

odorus

Agrigen-
tum,
Agrimonia.

odorus calls it the largest temple in the whole island: but adds, that the calamities of war caused the work to be abandoned before the roof could be put on; and that the Agrigentines were ever after reduced to such a state of poverty and dependence, that they never had it in their power to finish this superb monument of the taste and opulence of their ancestors. The length of this temple was 370 Greek feet, its breadth 60, and its height 220, exclusive of the foundations or basement story; the extent and solidity of its vaults and underworks were wonderful; its spacious porticoes and exquisite sculpture were suited to the grandeur of the whole. It was not built in the usual style of Sicilian temples with a cella of massive walls and a perystle, but was designed in a mixt taste with half columns let into the walls on the outside, the inside exhibiting a plain surface.

The next ruin belongs to the temple of Castor and Pollux; vegetation has covered the lower parts of the building, and only a few fragments of columns appear between the vines. This was the point of the hill where the wall stooped on the brink of a large fish-pond spoken of by Diodorus: it was cut in the solid rock 30 feet deep, and water was conveyed to it from the hills. In it was bred a great quantity of fish for the use of public entertainments; swans and various other kinds of wild fowl swam along its surface, for the amusement of the citizens, and the great depth of water prevented an enemy from surprising the town on that side. It is now dry and used as a garden. On the opposite bank are two tapering columns without their capitals, most happily placed in a tuft of carob trees. Monte Toro, where Hanno encamped with the Carthaginian army, before the Roman consuls drew him into an engagement that ruined his defensive plan, is a noble back-ground to this picturesque group of objects.—The whole space comprehended within the walls of the ancient city abounds with traces of antiquity, foundations, brick-arches, and little channels for the conveyance of water; but in no part are any ruins that can be presumed to have belonged to places of public entertainment. This is the more extraordinary, as the Agrigentines were a sensual people, fond of shows and dramatic performances, and the Romans never dwelt in any place long without introducing their savage games. Theatres and amphitheatres seem better calculated than most buildings to resist the outrages of time; and it is surprising that not even the vestiges of their form should remain on the ground.

AGRIMONIA, AGRIMONY: A genus of the digynia order, belonging to the dodecandria class of plants; and in the natural method ranking under the 35th order, *Senticosæ*. The characters are these: The calyx is a monophyllous perianthium, divided into five acute segments, persistent, and fenced with another calyx: The corolla consists of five petals, flat, and crenated at the ends: The stamina have ten capillary filaments, shorter than the corolla, and inserted into the calyx; the antheræ are small, didymous, and compressed: The pistillum has a germen beneath; the styli are two, simple, and the length of the stamina: There is no pericarpium; the calyx is contracted in the neck, and indurated: The seeds are two, and roundish. Of this genus there are five species enumerated by botani-

cal writers; but none of them have any remarkable properties except the two following.

Species and properties. 1. The eupatoria, or common agrimony, grows naturally in several parts of Britain by the sides of hedges and of woods. It is eat by sheep and goats, but refused by horses and swine. The Canadians are said to use an infusion of the root in burning fevers with great success. An infusion of six ounces of the crown of the root in a quart of boiling water, sweetened with honey, and half a pint of it drank three times a-day, is an effectual cure for the jaundice, according to Dr Hill. He advises to begin with a vomit, afterwards to keep the belly soluble, and to continue the medicine as long as any symptoms of the disease remain. It is said to be an aperient, detergent, and strengthener of the viscera. Hence it is recommended in scorbutic disorders, in debility, and laxity of the intestines, &c. Digested in whey, it affords an useful diet-drink for the spring-season, not ungrateful to the palate or stomach. Doctor Allston says, that the best mode of administering this herb is in powder, when the intention is to corroborate; and that if thus taken in a large quantity, we may expect many of the effects of the bark from it in agues.

2. The odorata, or sweet-scented agrimony. This grows near four feet high; the leaves have more pinnæ than the former; the serratures of the leaves are also sharper, and, when handled, they emit an agreeable odour. The leaves of this species make an agreeable cooling tea, which is sometimes prescribed by physicians as a drink for people in fevers.

Culture. Both these species may be propagated either by seed, or by parting the roots in autumn when the leaves begin to decay. The seeds ought also to be sown in this season; for if kept out of the ground till spring, they seldom come up that year.—Agrimony is a hardy perennial plant, and will thrive in almost any soil or situation; but the plants should not be placed nearer one another than two feet, that the roots may have room to spread.

Hemp-AGRIMONY. See **EUPATORIUM**.

Water Hemp-AGRIMONY. See **BIDENS**.

AGRIONIA, in Grecian antiquity, festivals annually celebrated by the Bœotians in honour of Bacchus. At these festivals, the women pretended to search after Bacchus as a fugitive; and, after some time, gave over their inquiry, saying, that he was fled to the Muses, and was concealed among them.

AGRIOPHAGI, in antiquity, a name given to those who fed on wild beasts. The word is Greek, compounded of *αγριος*, "wild," "savage," and *φαγω*, "I eat." The name is given, by ancient writers, to certain people, real or fabulous, said to have fed altogether on lions and panthers. Pliny and Solinus speak of *Agriophagi* in Ethiopia, and Ptolemy of others in India on this side the Ganges.

AGRIPPA, in midwifery, a term applied to children brought forth with their feet foremost.

AGRIPPA (Herod), the son of Aristobulus and Mariamne, and grandson to Herod the Great, was born in the year of the world 3997, three years before the birth of our Saviour, and seven years before the vulgar æra. After the death of Aristobulus

Agrimonia
||
Agrippa.

Agrippa. his father, Josephus informs us, that Herod his grandfather took care of his education, and sent him to Rome to make his court to Tiberius. The emperor conceived a great affection for Agrippa, and placed him near his son Drusus. Agrippa very soon won the graces of Drusus, and of the empress Antonia. But Drusus dying suddenly, all those who had been much about him were commanded by Tiberius to withdraw from Rome, lest the sight and presence of them should renew his affliction. Agrippa, who had indulged his inclination to liberality, was obliged to leave Rome overwhelmed with debts, and in a very poor condition. He did not think it fit to go to Jerusalem, because he was not able to make a figure there suitable to his birth. He retired therefore to the castle of Massada, where he lived rather like a private person than a prince. Herod the Tetrarch, his uncle, who had married Herodias his sister, assisted him for some time with great generosity. He made him principal magistrate of Tiberias, and presented him with a large sum of money: but all this was not sufficient to answer the excessive expences and profusion of Agrippa; so that Herod growing weary of assisting him, and reproaching him with his bad œconomy, Agrippa took a resolution to quit Judea and return to Rome. Upon his arrival, he was received into the good graces of Tiberius, and commanded to attend Tiberius Nero the son of Drusus. Agrippa, however, having more inclination for Caius the son of Germanicus, and grandson of Antonia, chose rather to attach himself to him; as if he had some prophetic views of the future elevation of Caius, who at that time was beloved by all the world. The great assiduity and agreeable behaviour of Agrippa so far engaged this prince, that he kept him continually about him.

Agrippa being one day overheard by Eutyches, a slave whom he had made free, to express his wishes for Tiberius's death and the advancement of Caius, the slave betrayed him to the emperor; whereupon Agrippa was loaded with fetters, and committed to the custody of an officer. Tiberius soon after dying, and Caius Caligula succeeding him, the new emperor heaped many favours and much wealth upon Agrippa; changed his iron fetters into a chain of gold; set a royal diadem upon his head; and gave him the tetrarchy which Philip, the son of Herod the Great, had been possessed of, that is, Batanæa and Trachonitis. To this he added that of Lyfania; and Agrippa returned very soon into Judea to take possession of his new kingdom.

Caius being soon after killed, Agrippa, who was then at Rome, contributed much by his advice to maintain Claudius in possession of the imperial dignity, to which he had been advanced by the army. But in this affair Agrippa acted a part wherein he showed more cunning and address than sincerity and honesty; for while he made a show of being in the interest of the senate, he secretly advised Claudius to be resolute, and not to abandon his good fortune. The emperor, as an acknowledgment for his kind offices, gave him all Judea and the kingdom of Chalcis, which had been possessed by Herod his brother. Thus Agrippa became of a sudden one of the greatest princes of the East; and was possessed of as much, if not more, territories than had been held by Herod the Great his

grandfather. He returned to Judea, and governed it to the great satisfaction of the Jews. But the desire of pleasing them, and a mistaken zeal for their religion, induced him to commit an unjust action, the memory of which is preserved in Scripture, Acts xii. 1, 2, &c. for about the feast of the passover, in the year of Jesus Christ 44, St James major, the son of Zebedee and brother to St John the Evangelist, was seized by his order and put to death. He proceeded also to lay hands on St Peter, and imprisoned him, waiting till the festival was over, that he might then have him executed. But God having miraculously delivered St Peter from the place of his confinement, the designs of Agrippa were frustrated. After the passover, this prince went from Jerusalem to Cæsarea, and there had games performed in honour of Claudius. Here the inhabitants of Tyre and Sidon waited on him to sue for peace. Agrippa being come early in the morning to the theatre, with a design to give them audience, seated himself on his throne, dressed in a robe of silver tissue, worked in the most admirable manner. The rising sun darted on it with its rays, and gave it such a lustre as the eyes of the spectators could not endure. When therefore the king spoke to the Tyrians and Sidonians, the parasites around him began to say, that it was the voice of a god, and not that of a man. Instead of rejecting these impious flatteries, Agrippa received them with an air of complacency; but at the same time observed an owl above him on a cord. He had seen the same bird before when he was in bonds by order of Tiberius; and it was then told him, that he should be soon set at liberty: but that whenever he saw the same thing a second time, he should not live above five days afterwards. He was therefore extremely terrified; and he died at the end of five days, racked with tormenting pains in his bowels, and devoured with worms. Such was the death of Herod Agrippa, after a reign of seven years, in the year of Christ 44.

AGRIPPA II. son of the preceding Herod, was made king of Chalcide; but three or four years after, he was deprived of that kingdom by Claudius, who gave him in the place of it other provinces. In the war Vespasian carried on against the Jews, Herod sent him a succour of 2000 men; by which it appears, that, tho' a Jew by religion, he was yet entirely devoted to the Romans, whose assistance indeed he wanted, to secure the peace of his own kingdom. He lived to the third year of Trajan, and died at Rome A. C. 100. He was the seventh and last king of the family of Herod the Great. It was before him and Berenice his sister that St Paul pleaded his cause at Cæsarea.

AGRIPPA (Marcus Vespasianus), son-in-law to Augustus, of mean birth, but one of the most considerable generals among the Romans. Augustus's victory over Pompey and Mark Antony was owing to his counsel. He adorned the city with the pantheon, baths, aqueducts, &c.

AGRIPPA (Cornelius), born at Cologne in 1486, a man of considerable learning, and by common report a great magician; for the monks at that time suspected every thing of heresy or forcery which they did not understand. He composed his *Treatise of the Excellence of Women*, to insinuate himself into the favour of Margaret of Austria, governess of the Low-Countries. He accepted of the charge of historiographer to the emperor

Agrippina ^{||} **Agrostema.** ^{||} **Agrostis**
 Agrippina, which that princefs gave him. The treatise of the *Vanity of the Sciences*, which he published in 1530, enraged his enemies extremely; as did that of *Occult Philosophy*, which he printed soon after at Antwerp. He was imprisoned in France for something he had written against Francis I.'s mother; but was enlarged, and went to Grenoble, where he died in 1534. His works are printed in two volumes octavo.

AGRIPPINA, daughter of Germanicus, sister of Caligula, and mother of Nero; a woman of wit, but excessively lewd. She was thrice married, the last time to Claudius her own uncle, whom she poisoned to make way for Nero her son. Nero afterwards caused her to be murdered in her chamber, when she bid the executioner stab her first in the belly that had brought forth such a monster.

AGRIPPINA COLONIA UBIORUM (anc. geog.), now *Cologne*: so called from Agrippina, the daughter of Germanicus, and mother of Nero, who had a colony sent thither at her request by the emperor Claudius, to honour the place of her birth. See *COLOGNE*.

AGRIPPINIANS, in church-history, the followers of Agrippinus bishop of Carthage, in the third century, who first introduced and defended the practice of re-baptization.

AGROM, a disease frequent in Bengal and other parts of the Indies, wherein the tongue chaps and cleaves in several places, being extremely rough withal, and sometimes covered with white spots. The Indians are very fearful of this disease, which they attribute to extreme heat of the stomach. Their remedy is, to drink some chalybeate liquor, or the juice of mint.

AGROSTEMA, **WILD LYCHNIS**, or **CAMPION**: A genus of the pentagynia order, belonging to the decandria class of plants; and in the natural method ranking under the 22d order, *Caryophyllei*. The characters are: The *calyx* is a single-leaved perianthium, leathery, tubular, quinque-dentated, and persistent: The *corolla* consists of five unguled petals: The *filamina* have ten subulated filaments; the antheræ are simple: The *pistillum* has an egg-shaped germen; the styli are five, filiform, erect, and the length of the filamina; the stigmata are simple: The *pericarpium* is an oblong covered capsule, having two cells and five valves: The *seeds* are numerous and kidney-shaped; the receptacula are as many as the seeds, the interior ones gradually longer.

Species. The most remarkable are, 1. The githago, hairy wild lychnis, or common campion, which grows naturally in corn-fields in most parts of Britain. The flowers appear in June, are generally purple, sometimes white, and by cultivation yellow.

2. The coronaria, or single-rose campion. Of this species there are four varieties; one with deep red, another with flesh-coloured, a third with white, flowers; and a sort with double flowers, which has turned most of the others out of the gardens.

3. The flos jovis, or umbelliferous mountain-campion, grows naturally upon the Helvetian mountains. It is a low plant with woolly leaves: the flower-stem rises near a foot high; the flowers grow in umbels on the top of the stalk, and are of a bright red colour. They appear in July, and the seeds ripen in September.

Culture. The first and third species are annual plants, so must be propagated by seeds; but as the

VOL. I. Part I.

first is found naturally in corn-fields, it is very seldom cultivated in gardens; the third sort should have a shady situation, and thrives best in a strong soil. The second species is perennial, but only those varieties which have single flowers produce any seeds; the double kind, therefore, as it produces no seeds, must be propagated by parting the roots in autumn, after the flowers are past. In doing this, every head which can be slipped off with roots should be parted: these should be planted in a border of fresh undunged earth, at the distance of six inches one from the other, observing to water them gently until they have taken root; after which they will require no more; for much wet is very injurious to them, as is also dung. In this border they may remain till spring, when they should be planted in the borders of the flower-garden, where they will be very ornamental during the time of their flowering, which is in July and August.—This plant is eat by horses, goats, and sheep.

AGROSTIS, **BENT-GRASS**, in botany: A genus of the triandria order, belonging to the digynia class of plants; and, in the natural method, ranking under the 4th order, *Gramina*. The characters are: The *calyx* is a one-flowered, two-valved, pointed gluma, rather less than the corolla. The *corolla* is two-valved and pointed. The *filamina* have three capillary filaments, which are larger than the corolla. The *antheræ* are forked. The *pistillum* has a roundish germen; the styli are two, reflected, and villous; the stigmata hisped longitudinally. The *pericarpium* is the corolla growing to the seed, not gaping. The *seed* is one, globular, and pointed at both ends. There are 15 species; eight of them natives of Britain.

AGROSTOGRAPHIA, signifies the history or description of grasses. See *GRASS*.

AGROUND, the situation of a ship whose bottom, or any part of it, hangs, or rests upon the ground, so as to render her immoveable, till a greater quantity of water floats her off, or till she is drawn out into the stream by the application of mechanical powers.

AGRYPNIA, among physicians, implies an inaptitude to sleep; a troublesome symptom of feverish and other disorders.

AGRYPNIA, in the Greek church, implies the vigil of any of the greater festivals.

AGUE, a general name for all periodical fevers, which, according to the different times of the returns of the feverish paroxysm, are denominated tertian, quartan, and quotidian. See *MEDICINE-Index*.

Ague-Cake, the popular name for a hard tumour on the left side of the belly, lower than the false ribs, said to be the effect of intermittent fevers.

Ague-Tree, a name given to the *sassafras*, on account of its febrifuge qualities.

AGUEPERSE, a town of France, situated on the Lyonnais, about 15 miles north of Clermont.

AGUILLANEUF, or **AUGILLANEUF**, a form of rejoicing used among the ancient Franks on the first day of the year. The word is compounded of the French *A* "to," *gui* "mistleto," and *l'an neuf* "the new year." Its origin is traced from a druid-ceremony: the priests used to go yearly in December, which with them was reputed a sacred month, to gather mistleto of the oak in great solemnity. The prophets marched in the front, singing hymns in honour of their deities; after

Agrostis
 ||
Aguilla-
 neuf.

Aguillar
||
Agur.

after them came a herald with a caduceus in his hand; these were followed by three druids a-breast, bearing the things necessary for sacrifice; last of all came the chief or arch druid, accompanied with the train of people. The chief druid climbing the oak, cut off the mistleto with a golden sickle, and the other druids received it in a white cloth; on the first day of the year it was distributed among the people, after having blessed and consecrated it by crying *A gui l'an neuf*, to proclaim the new year. This cry is still continued in Picardy, with the addition of *Plantez, Plantez*, to wish a plentiful year. In Burgundy and some other parts, the children use the same word to beg a new-year's gift. Of latter times the name *Aguillaneuf* was also given to a sort of begging, practised in some dioceses, for church-tapers, on new year's day, by a troop of young people of both sexes, having a chief, &c. It was attended with various ridiculous ceremonies, as dancing in the church, &c. which occasioned the synods to suppress it.

AGUILLAR, a town of Spain, in the province of Navarre, about 24 miles west of Estella.

AGUILLAR *Del Campo*, a town of Old Castile, with the title of marquissate, about 15 leagues north of the city of Burgos.

AGUILLONIUS (Francis), a Jesuit, born at Brussels: he was rector of the Jesuits college at Antwerp, and eminent for his skill in mathematics. He was the first who introduced that science among the Jesuits in the low countries: he wrote a book of Optics, and was employed in finishing his Catoptrics and Dioptrics, when death prevented him in 1617.

AGUIRRA (Joseph Sænz de), a Benedictine, and one of the most learned men of the 17th century, was born March 24. 1630. He was censor and secretary of the supreme council of the inquisition in Spain, and interpreter of the scriptures in the university of Salamanca. He printed three volumes in folio upon Philosophy, a commentary upon Aristotle's ten books of Ethics, and other pieces. He died at Rome August 19. 1699.

AGUL, in botany, a synonyme of the hedyсарum. See HEDYSARUM.

AGUR. The xxxth chapter of the Proverbs begins with this title: "The words of Augur, the son of Jakeh;" which, according to the signification of the original terms, may be translated, as the Vulgate has it, *Verba congregantis, filii vomentis*; which translation Le Clerc condemns, supposing these to be proper names, which ought not to be translated. These words are rendered by Louis de Dieu: "the words of him who has recollected himself, the son of obedience." The generality of the fathers and commentators will have it, that Solomon describes himself under the name of Agur the son of Jaketh; others conjecture that Agur, as well as Lemuel (in chap. xxxi. 1.) were wise men who lived in the time of Solomon, and were his interlocutors in the book of Proverbs; an opinion which F. Calmet thinks is without the least shew of probability, this book being nothing like a dialogue. This last expositor thinks it probable, that Agur was an inspired author different from Solomon, whose sentences it was thought fit to join with those of this prince, because of the conformity of their matter.

AGURAH, in Jewish antiquity, the name of a silver coin, otherwise called *gerah* and *keshta*.

AGURIUM, or AGYRIUM (anc. geog.), a town of Sicily in the Val di Demona, near the river Sementus. The people were called *Populus Agyrinensis* by Cicero; *Agyrinus* by Pliny. It was the birth-place of Diodorus Siculus, as he himself testifies; but he calls it *Argyrium*, as it is now called *S. Philippo d'Argirone*, which modern name seems to confirm that *Argyrium* is the true reading.

AGUSADURA, in ancient customs, a fee due from vassals to their lord for the sharpening their ploughing tackle. Anciently the tenants in some manors were not allowed to have their rural implements sharpened by any but whom the lord appointed; for which an acknowledgment was to be paid, called *Agu sadura*, in some places *Agusage*: which some take to be the same with what was otherwise called *Reillage*, from the ancient French *reille*, a ploughshare.

AGUTI, in zoology, the trivial name of a species of the mouse, belonging to the mammalia glires of Linnæus. See MUS.

AGYEI, in antiquity, a kind of obelisks, sacred to Apollo, erected in the vestibles of houses, by way of security.

AGYNIANI, in church-history, a sect who condemned all use of flesh, and marriage, as not instituted by God, but introduced at the instigation of the devil. The word is compounded of the privative *a* and *γυν* woman. They are sometimes also called *Agynneses*, and *Agynii*; and are said to have appeared about the year 694. It is no wonder they were of no long continuance. Their tenets coincide in a great measure with those of the Abelians, Gnostics, Cerdonians, and other preachers of chastity and abstinence.

AGYRTÆ, in antiquity, a kind of strolling impostors running about the country, to pick up money by telling fortunes at rich mens doors, pretending to cure diseases by charms, sacrifices, and other religious mysteries; also to expiate the crimes of their deceased ancestors, by virtue of certain odours and fumigations; to torment their enemies, by the use of magical verses and the like. The word is Greek *αγυρται*, formed of the verb *αγυρω*, *I congregate*; alluding to the practice of Charletans, who gather a crowd about them.

Agyrtæ, among the Greeks, amount to the same with *Æruscatores* among the Latins, and differ not much from Gypsies among us.

AHAB, son of Ormi king of Israel, succeeded his father A.M. 3086, and surpassed all his predecessors in impiety and wickedness. He married Jezebel the daughter of Ethbaal king of the Zidonians, who introduced the idols of Baal and Astarte among the Israelites, and engaged Ahab in the worship of these false deities. God, being provoked by the sins of Ahab, sent the prophet Elijah to him (1 Kings xvii. 1, seq.) who declared to him, that there would be a famine of three years continuance. The dearth having lasted three years, the prophet desired Ahab to gather all the people to mount Carmel, and with them the prophets of Baal: when they were thus assembled, Elijah caused fire to descend from heaven upon his sacrifice, after which he obtained of God that it should rain; and then the earth recovered its former fertility. Six years after this, Ben-hadad king of Syria (chap. xx.)

Agurah
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Ahab.

Ahab. xx.) laid siege to Jerusalem. But God, provoked at this proud Syrian, sent a prophet to Ahab, not only to assure him of victory, but to instruct him likewise in what manner he was to obtain it. Ahab was ordered to review the princes of the provinces, which he found to be a choice company consisting of 232 young men, who were to command the people in Samaria, amounting to about 7000 men: with this small army Ahab was directed to fall upon the great host of the Syrians, and that at noon-day, while Ben-hadad and the 32 kings that accompanied him were drinking and making merry. Ben-hadad having notice that they were marching out of the city, ordered them to be brought before him alive, whatever their designs were: but the young men, followed by this small army, advanced, and killing all that opposed them, such a panic seized the Syrian troops, that they began to fly; and even Ben-hadad himself mounted his horse and fled with his cavalry; which Ahab perceiving, pursued them, killed great numbers of them, and took a considerable booty. After this the prophet came to Ahab, to animate him with fresh courage, and to caution him to keep upon his guard; assuring him, that Ben-hadad would return against him the year following. According to this prediction, at the end of the year he returned and encamped at Aphek, with a resolution to give the Israelites battle. Both armies being ranged in order of battle for seven days successively, at length, upon the seventh day, a battle ensued, wherein the Israelites killed 100,000 of the Syrians, and the rest fled to Aphek; but as they were pressing to get into the city, the walls of Aphek fell upon them and killed 27,000 more. Ben-hadad throwing himself upon the mercy of Ahab, this prince received him into his own chariot, and made an alliance with him. The year following, Ahab desiring to make a kitchen-garden near his palace (chap. xxi.), requested of one Naboth, a citizen of Jezreel, that he would sell him his vineyard, because it lay convenient for him. But being refused, he returned in great discontentment to his house, threw himself upon the bed, turned towards the wall, and would eat nothing. Jezebel his wife coming in, asked the reason of his great concern; of which being informed, she procured the death of Naboth, and Ahab took possession of his vineyard. As he returned from Jezreel to Samaria, the prophet Elijah met him, and said, "Hast thou killed and also taken possession? Now saith the Lord, In the place where dogs licked up the blood of Naboth, shall dogs lick thy blood, even thine. As for Jezebel, of her the Lord spake, saying, The dogs shall eat Jezebel by the way of Jezreel." Ahab, hearing these and other denunciations, rent his clothes, put sackcloth upon his flesh, and gave other indications of his sorrow and repentance. But his repentance was neither sincere nor persevering. Two years after these things, Jehoshaphat king of Judah came to Samaria to visit Ahab (chap. xxii.) at a time when he was preparing to attack Ramoth-gilead, which Ben-hadad king of Syria unjustly withheld from him. The king of Israel invited Jehoshaphat to accompany him in this expedition; which that prince agreed to do, but desired that some prophet might first be consulted. Ahab therefore assembled the prophets of Baal, in number about 400; who all concurred in exhorting the king to march resolutely against Ramoth-gilead. But Micaiah

being also consulted, at Jehoshaphat's suggestion, prophesied the ruin of Ahab. Upon this, Ahab gave orders to his people to seize Micaiah, and to carry him to Amon the governor of the city, and to Joash the king's son; telling him in his name, "Put this fellow in prison, and feed him with the bread of affliction, and with the water of affliction, until I come in peace." But Micaiah said, "If thou return at all in peace, the Lord hath not spoken by me." Ahab therefore and Jehoshaphat marched up to Ramoth-gilead; and the king of Israel said unto Jehoshaphat, "I will disguise myself, and enter into the battle, but put thou on thy robes:" for he knew that the king of Syria had commanded two and thirty captains that had rule over his chariots, saying, "Fight neither with small nor with great, save only with the king of Israel." These officers therefore having observed that Jehoshaphat was dressed in royal robes, took him for the king of Israel, and fell upon him with great impetuosity: but this prince seeing himself pressed so closely, cried out; and the mistake being discovered, the captains of the king of Syria gave over pursuing him. But one of the Syrian army shot a random arrow, which pierced the heart of Ahab. The battle lasted the whole day, and Ahab continued in his chariot with his face turned towards the Syrians. In the mean time, his blood was still issuing from his wound, and falling in his chariot; and towards the evening he died: whereupon proclamation was made by sound of trumpet, that every man should return to his own city and country. The king of Israel being dead, was carried to Samaria and buried: but his chariot and the reins of his horses were washed in the fish-pool of Samaria, and the dogs licked his blood, according to the word of the prophet. Such being the end of Ahab. His son Ahaziah succeeded him in the year of the world 3107.

AHÆTULA, the trivial name of a species of the coluber. See COLUBER.

AHASUERUS, or ARTAXERXES, the husband of Esther; and according to archbishop Usher and F. Calmet, the scripture name for Darius, the son of Hystaspes, king of Persia; though Scaliger will have Xerxes to be the husband of Esther, or the Ahafuerus of scripture; and Dr Prideaux believes him to be Artaxerxes Longimanus. See HISTORY OF PERSIA.

AHAZ, king of Judah, the son of Jotham, remarkable for his vices and impieties. One of his sons he consecrated, by making him pass through and perish by the fire, in honour of the false god Moloch; and he offered sacrifices and incense upon the high places, upon hills, and in groves. Rezin king of Syria and Pekah king of Israel invaded Judea in the beginning of the reign of Ahaz; and having defeated his army and pillaged the country, they laid siege to Jerusalem. When they found that they could not make themselves masters of that city, they divided their army, plundered the country, and made the inhabitants prisoners of war. Rezin and his part of the confederate army marched with all their spoil to Damascus; but Pekah with his division of the army having attacked Ahaz, killed 120,000 men of his army in one battle, and carried away men, women, and children, without distinction, to the number of 200,000. But as they were carrying those captives to Samaria, the prophet Oded, with the principal inhabitants of the city,

Ahaz
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Ahead.

city, came out to meet them; and by their remonstrances prevailed with them to set their prisoners at liberty. At the same time, the Philistines and Edomites invaded other parts of his land, killed multitudes of the people, and carried off much booty. In this distressed condition, Ahaz finding no other remedy for his affairs, sent ambassadors to Tiglath-pileser king of the Assyrians; and to engage him to his interest, he stripped the temple and city of all the gold which he could meet with, and sent it as a present. Accordingly Tiglath-pileser marched to the assistance of Ahaz, attacked Rezin and killed him, took his capital Damascus, destroyed it, and removed the inhabitants thereof to Cyrene.

The misfortunes of this prince had no influence to make him better: on the contrary, in the times of his greatest affliction, he sacrificed to the Syrian deities, whom he looked upon as the authors of his calamities, and endeavoured to render propitious to him, by honouring them in this manner. He broke in pieces the vessels of the house of God, shut up the gates of the temple, and erected altars in all parts of Jerusalem. He set up altars likewise in all the cities of Judah, with a design to offer incense on them. At length he died, and was buried in Jerusalem, but not in the sepulchres of the kings of Judah his predecessors; which honour he was deprived of, on account of his iniquitous course of life. Hezekiah his son succeeded him in the year of the world 3278, before Jesus Christ 726.

AHAZIAH, the son and successor of Ahab king of Israel, reigned two years, part alone, and part with his father Ahab, who ordained him his associate in the kingdom a year before his death. Ahaziah imitated his father's impieties (1 Kings xxii. 52, seq.), and paid his adoration to Baal and Astarte, the worship of whom had been introduced in Israel by Jezebel his mother. The Moabites, who had been always obedient to the kings of the ten tribes ever since their separation from the kingdom of Judah, revolted after the death of Ahab, and refused to pay the ordinary tribute. Ahaziah had not leisure or power to reduce them (2 Kings i. 1, 2, &c.): for about the same time, having fallen through a lattice from the top of his house, he hurt himself considerably, and sent messengers to Ekron, in order to consult Baalzebub, the god of that place, whether he should recover of the indisposition occasioned by this accident. But the prophet Elijah went to Ahaziah, and declared that he should not recover from his illness: and accordingly he died in the year of the world 3108, and Jehoram his brother succeeded to the crown.

AHAZIAH, king of Judah, the son of Jehoram and Athaliah, succeeded his father in the kingdom of Judah in the year of the world 3119. He walked in the ways of Ahab's house, to which he was allied, his mother being of that family. He reigned only one year, being slain by Jehu the son of Nimshi.

AHEAD, a sea-term, signifying further onward than the ship, or at any distance before her, lying immediately on that point of the compass to which her stem is directed. It is used in opposition to *astern*, which expresses the situation of any object behind the ship. See *ASTERN*.

AHICCYATLI, in zoology, the Indian name of Ahiccyatli a serpent resembling the rattlesnake, only it wants the rattles. It is as fatal in the effect of its poison as any known species of serpent.

AHIJAH, the prophet of Shilo. He is thought to be the person who spoke twice to Solomon from God, once while he was building the temple (1 Kings vi. 11.), at which time he promised him his protection; and at another time (*id.* xi. 6.) after his falling into all his irregularities, when God expressed his indignation with great threatenings and reproaches. Ahijah was one of those who wrote the annals or history of this prince (2 Chr. ix. 29.). The same prophet declared to Jeroboam that he would usurp the kingdom (1 Kings xi. 29, &c.), and that two heifers should alienate him from the Lord, meaning the golden calves erected by Jeroboam, one at Dan, the other at Bethel. About the end of Jeroboam's reign, towards the year of the world 3046, Abijah the son of that prince fell sick; upon which Jeroboam sent his wife to this prophet to inquire what would become of the child. The queen therefore went to Ahijah's house in Shilo, disguised: But the prophet, upon hearing the sound of her feet, said, "Come in, thou wife of Jeroboam, why feignest thou thyself to be another? for I am sent to thee with heavy tidings." Then he commanded her to go and tell Jeroboam all the evil that the Lord had declared he would bring upon his house for his impieties; that so soon as she would enter into the city her son Abijah should die, and should be the only one of Jeroboam's house that should come to the grave or receive the honours of a burial. Ahijah in all probability did not long survive the time of this last prophecy; but with the time and manner of his death we are not acquainted.

AHITOPHEL, a native of Gillo, was for some time the counsellor of king David, whom he at length deserted, by joining in the rebellion of Absalom. This prince, upon his being preferred to the crown by the greatest part of the Israelites, sent for Ahitophel from Gillo (2 Sam. xv. 12.) to assist him with his advice in the present state of his affairs: for at that time Ahitophel's counsels were received as the oracles of God himself (chap. xvi. *ult.*). Nothing gave David more uneasiness than this event; and when Hushai his friend came to wait on him and attend him in his flight, he intreated him to return rather to Jerusalem, make a show of offering his services to Absalom, and endeavour to frustrate the prudent measures which should be proposed by Ahitophel. When Absalom was come to Jerusalem, he desired Ahitophel to deliberate with his other counsellors upon the measures which were proper for him to take. Ahitophel advised him in the first place to abuse his father's concubines; so that when his party should understand that he had dishonoured his father in this manner, they might conclude that there were no hopes of a reconciliation, and therefore espouse his interest more resolutely. A tent, therefore, being prepared for this purpose upon the terraces of the king's palace, Absalom, in the sight of all Israel, lay with his father's concubines. The next thing Ahitophel proposed was in the terms following: "Let me now choose out 12,000 men, and I will arise and pursue after David this night, and I will come upon him while he is weary and weak-handed, and I will make him

Ahimella him afraid, and all the people that are with him shall flee, and I will smite the king only; and I will bring back all the people unto thee; the man whom thou seekest is as if all returned; so all the people shall be in peace." This advice was very agreeable to Absalom and all the elders of Israel. However, Absalom desired Hushai to be called to have his opinion. Hushai being come, and hearing what advice Ahitophel had given, said, The counsel which Ahitophel has given is not given at this time; what, for the present, in my opinion, may do better, is this: Let all Israel be gathered unto thee, from Dan even to Beer-sheba, as the sand that is by the sea for multitude, and put thyself in the midst of them, and wherever David is, we may fall upon him, and overwhelm him with our numbers, as the dew falleth upon the ground. This last advice being more agreeable to Absalom and all the elders of Israel, was preferred; upon which Ahitophel saddled his ass, went to his house at Gillo, hanged himself, and was buried in the sepulchre of his fathers. He foresaw, without doubt, all that would happen in consequence of Hushai's advice, and was determined to prevent the death which he had deserved, and which David would probably have inflicted on him, as soon as he should be resettled on his throne.

AHMELLA, in botany. See **BIDENS**.

AHOLIBAH and **AHOLAH**, are two feigned names made use of by Ezekiel (xxiii. 4.) to denote the two kingdoms of Judah and Samaria. Aholah and Aholibah are represented as two sisters of Egyptian extraction. Aholah stands for Samaria, and Aholibah for Jerusalem. The first signifies a *tent*; and the second, *my tent is in her*. They both prostituted themselves to the Egyptians and Assyrians, in imitating their abominations and idolatries: for which reason they were abandoned to those very people for whom they had shown so passionate and so impure an affection; they were carried into captivity, and reduced to the severest servitude.

AHOUI, in botany, a synonyme and also the trivial name of a species of **CERBERA**.

A-HULL, in the sea-language, the situation of a ship when all her sails are furled on account of the violence of the storm, and when having lashed her helm on the lee-side, she lies nearly with her side to the wind and sea, her head being somewhat inclined to the direction of the wind.

AHUN, a town in France, in the Upper Marche and generality of Moulins; and is a royal jurisdiction. It is seated on the river Creuse, near a Benedictine abbey of the same name, eight miles south-east of Gueret, 30 north-east of Lomages, and 55 south-east of Moulins. E. Long. 2. 8. N. Lat. 49. 5.

AHUYS, a town of Sweden. It is small, but very strong by its situation, and has a good port. It is in the principality of Gothland, in the territory of Blekinge, near the Baltic sea, about 18 miles from Christianstad. E. Long. 14. 10. N. Lat. 56. 20.

AI, (anc. geog.) a town in Judea, to the north of Jericho, called *Aiya* by Josephus, and the inhabitants *Ainata*. Joshua having sent a detachment of 3000 men against Ai, God permitted them to be repulsed on account of Achan's sin, who had violated the anathema pronounced against the city of Jericho. But after the expiation of this offence, God commanded Joshua

(chap. viii.) to march with the whole army of the Israelites against Ai, and treat this city and the kingdom thereof as he had treated Jericho, with this difference, that he gave the plunder of the town to the people. Joshua sent by night 30,000 men to lie in ambush behind Ai; having first well instructed those who had the command of them in what they were to do; and the next day, early in the morning, he marched against the city with the remainder of his army. The king of Ai perceiving them, sallied hastily out of the town with all his people, and fell upon the forces of the Israelites; who upon the first onset fled, as if they had been under some great terror.

As soon as Joshua saw the enemy all out of the gates, he raised his shield upon the top of a pike, which was the signal given to the ambuscade; whereupon they immediately entered the place, which they found without defence, and set fire to it. The people of Ai perceiving the smoke ascending, were willing to return, but discovered those who had set fire to the city in their rear, while Joshua and those who were with him turning about, fell upon them, and cut them in pieces. The king was taken alive, and afterwards put to death.

The chevalier Folard observes, that Joshua's enterprise on Ai, excepting in some particulars of military art, is very like that of Gibeah, which is scarce any thing more than a copy of it. It would appear, says that writer, by the scripture account, that Joshua was not the author of the stratagem made use of by him: for when God directs himself to Joshua, he says, 'Go up against Ai; lay an ambuscade behind the town; I have delivered the king and the people of it into thine hands:' yet notwithstanding this, God might leave the whole glory of the invention and execution of it to him, as to a great general. 'Joshua arose,' says the sacred author, 'and all the people of war, to go up against Ai (verse 3.); and Joshua chose out 30,000 mighty men of valour, and sent them away by night.' Folard remarks, that there is a manifest contradiction between this verse and the 12th, wherein it is said, that Joshua chose out 500 men, whom he sent to lie in ambush, between Bethel and Ai. How is this to be reconciled? Calmet says, that Masius allows but 5000 men for the ambuscade, and 25,000 for the attack of the city, being persuaded that an army of 600,000 men could only create confusion on this occasion, without any necessity for, or advantage in, such numbers: but the generality of interpreters, continues Calmet, acknowledge two bodies to be placed in ambuscade, both between Bethel and Ai; one of 25,000, and the other of 5000 men.

With regard to the signal Joshua made to that part of his army which lay in ambuscade, the learned Folard embraces the opinion of the Rabbins, who believe what is called the shield to be too small to serve for a signal: hence they make it to be the staff of one of their colours: from this, our author concludes, that the whole colours were used on the occasion; for in the Asiatic style, which is very near the poetic, the part is oftentimes to be taken for the whole.

AJALON, (anc. geog.) a town of the tribe of Dan, one of the Levitical. Another in the tribe of Benjamin, in whose valley Joshua commanded the moon to stand still, being then in her decrease, and

Ai
Ajalon

Ajan
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Aichstat.

consequently to be seen at the same time with the fun.

AJAN, a coast and country of Africa, has the river Quilmanci on the south; the mountains from which that river springs, on the west; Abyssinia, or Ethiopia, and the Straight of Babelmandel, on the north; and the Eastern, or Indian Ocean, on the east. The coast abounds with all necessaries of life, and has plenty of very good horses. The kings of Ajan are often at war with the emperor of the Abyssins; and all the prisoners they take they sell to the merchants of Cambaya, those of Aden, and other Arabs, who come to trade in their harbours, and give them in exchange, coloured cloths, glass-beads, raisins, and dates; for which they also take back, besides slaves, gold and ivory. The whole sea-coast, from Zanguebar to the Straight of Babelmandel, is called the coast of Ajan; and a considerable part of it is styled the Desert-coast.

AJAX, the son of Oileus, was one of the principal generals that went to the siege of Troy. He ravished Cassandra the daughter of Priam, even in the temple of Minerva, where she thought to have found sanctuary. It is said, he made a serpent of fifteen feet long so familiar with him, that it eat at his table, and followed him like a dog. The Locrians had a singular veneration for his memory.

AJAX, the son of Telamon, was, next to Achilles, the most valiant general among the Greeks at the siege of Troy. He commanded the troops of Salamis, and performed many great actions, of which we have an account in the Iliad, in *Diety's Cretensis*, and in the 23d book of Ovid's *Metamorphoses*. He was so enraged that the arms of Achilles were adjudged to Ulysses, that he immediately became mad. The Greeks paid great honours to him after his death, and erected a magnificent monument to his memory upon the promontory of Rhetium.

AJAX, in antiquity, a furious kind of dance, in use among the Grecians; intended to represent the madness of that hero after his defeat by Ulysses, to whom the Greeks had given the preference in his contest for Achilles's arms. Lucian, in his treatise of Dancing, speaks of dancing the *Ajax*.—There was also an annual feast called *Ajantia*, *Aixantia*, consecrated to that prince, and observed with great solemnity in the island of Salamis, as well as in Attica: where, in memory of the valour of Ajax, a bier was exposed, set out with a complete set of armour.

AJAZZO, a sea-port town of the island of Corsica, in the Mediterranean, with a bishop's see. Long. 26. 35. Lat. 41. 40.

AJAZZO, a sea-port town of Natolia, in the province of Caramania, anciently Silesia, seated on the coast of the Mediterranean, 30 miles north of Antioch and 50 west of Aleppo, where the city of Iffus anciently stood, and near which Alexander fought his second battle with Darius. Long. 33. 10. Lat. 37. 0.

AICHSTAT, a town of Germany, in Franconia, and capital of a bishopric of the same name. It is remarkable for a curious piece of workmanship, called the Sun of the Holy Sacrament, which is in the church. It is of massy gold, of great weight, and is enriched with 350 diamonds, 1400 pearls, 250 rubies, and other precious stones. This place is moderately large, and seated in a valley on the river Altmul, 10 miles N.

of Newburgh, and 37 S. of Nuremberg. E. Lon. 11. 10. N. Lat. 49. 0. The bishopric is 45 miles in length and 17 in breadth; and the bishop is chancellor of the church of Mayence or Mentz.

AICUROUS, a species of parrot. See *PSITTACUS*.

AID, in a general sense, denotes any kind of assistance given by one person to another.

AID, in law, denotes a petition made in court to call in help from another person who has interest in land, or any other thing contested.

Aid-de-camp, in military affairs, an officer employed to receive and carry the orders of a general.

AID, *Auxilium*, in ancient customs, a subsidy paid by vassals to their lords on certain occasions. Such were the aid of relief, paid upon the death of the Lord Mesne to his heir; the *aid cheval*, or capital aid, due to the chief lord on several occasions, as, to make his eldest son a knight, to make up a portion for marrying his daughter, &c.

AIDS, in the French customs, certain duties paid on all goods exported or imported into that kingdom.

Court of Aids, in France, a sovereign court established in several cities, which has cognizance of all causes relating to the taxes, gabelles, and aids, imposed on several sorts of commodities, especially wine.

AIDS, in the manege, are the same with what some writers call *cherishings*, and used to avoid the necessity of corrections.—The inner heel, inner leg, inner rein, &c. are called *inner aids*; as the outer heel, outer leg, outer rein, &c. are called *outer aids*.

AIDAN, a famous Scottish bishop of Landisfarne, or Holy Island, in the 7th century, was employed by Oswald king of Northumberland in the conversion of the English, in which he was very successful. He died in 651.

AIGHENDALE, the name of a liquid measure used in Lancashire, containing seven quarts.

AIGLE, a bailiwick in the territory of Romand in Switzerland, consists of mountains and valleys, the principal of which are the Aigle and Bex. Through these is the great road from Vallais into Italy. When you pass by Villeneuve, which is at the head of the lake of Geneva, you enter into a deep valley three miles wide, bordered on one side with the Alps of Switzerland, and on the other with those of Savoy, and crossed by the river Rhone. Six miles from thence you meet with Aigle, a large town, seated on a wide part of the valley, where there are vineyards, fields, and meadows. The governor's castle is on an eminence that overlooks the town, and has a lofty marble tower. This government has nine large parishes; and is divided into four parts, Aigle, Bex, Olon, and Ormont. This last is among the mountains, and joins to Rougement. It is a double valley, abounding in pasture-lands. Ivorna, in the district of Aigle, was in part buried by the fall of a mountain, occasioned by an earthquake in 1584.

AIGLE, a small town, in France, in Upper Normandy, twenty-three miles from D'Evereux, and thirty-eight from Rouen. It is surrounded with walls and ditches, has six gates, three suburbs, and three parishes. It trades in corn, toys, and more particularly in needles and pins. E. Long. 1. 5. N. Lat. 48. 35.

AIGUILLON, a small town of France in the province of Guienne, situated at the conflux of the rivers Garonne and Lot.

Aid
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Aiguillon.

Aiguifce
||
Ailred.

AIGUISCE, in heraldry, denotes a cross with its four ends sharpened, but so as to terminate in obtuse angles.—It differs from the cross fitchee, in as much as the latter tapers by degrees to a point, and the former only at the ends.

AILANA, **AILATH**, or **AHELOTH**, anciently a town of Arabia Petræa, situated near the Sinus Elnites of the Red Sea. It was also called *Elatb*, and *Eloth* (Stephanus, Strabo, Moses). The same with *Elana*.

AILLE, in law, a writ which lies where a person's grandfather, or great-grandfather, being seised of lands, &c. in fee-simple, the day that he died, and a stranger abates and enters the same day, and dispossesses the heir of his inheritance.

AILESBUURY, **AYLESBUURY**, or **ALESBUURY**, a borough town in Buckinghamshire, consisting of about 400 houses. It consists of several streets, though the houses are not very contiguous: these lie round about the market-place, in the middle of which is a convenient hall, where the sessions are held, and sometimes the assizes for the county. It sends two members to Parliament; has a market on Saturdays; and three fairs for cattle; viz. on the Saturday before Palm-sunday, June 14th, and September 25th. It is sixty miles south-east of Buckingham, and forty-four north-west of London. W. Long. 0. 40. N. Lat. 51. 40.

AILMER, or **ÆTHELMARE**, Earl of Cornwall and Devonshire, in the reign of King Edgar. It is not known of what family he was. His authority and riches were great, and so also in appearance was his piety. He founded the abbey of Cerne, in Dorsetshire; and had so great a veneration for Eadwald, the brother of St Edmund the Martyr, who had lived a hermit in that country, near the Silver Well, as they called it, that, with the assistance of Archbishop Dunstan, he translated his relics to the old church of Cernel. In 1016, when Canute, the son of Suane, invaded England, and found himself stoutly opposed by that valiant Saxon prince Edmund Ironside, the son of Æthelred, this Earl Ailmer, with that arch traitor Eadric Streone, Earl of Mercia, and Earl Algar, joined the Dane against their natural prince, which was one great cause of the Saxons ruin. He did not long survive this; and we find mentioned in history only one son of his, whose name was Æthelward, Earl of Cornwall, who followed his father's maxims, and was properly rewarded for it. For in 1018, Canute reaping the benefit of their treasons, and perceiving that the traitors were no longer useful, he caused the infamous Eadric Streone, and this Earl Æthelward, to be both put to death.

AILRED, or **EALRED**, abbot of Revesby in Lincolnshire, in the reigns of Stephen and Henry II. He was born in 1109, of a noble family, and educated in Scotland with Henry the son of King David. On his return to England, he became a monk of the Cistercian order, in the monastery of Revesby, of which he afterwards was made abbot. He died on the 12th of January 1166, aged 57, and was buried in his monastery. "He was (says Leland) in great esteem during his life; celebrated for the miracles wrought after his death; and admitted into the catalogue of saints." He was author of several works; most of which were published by Gilbo the Jesuit at Douay, 1631; part

of them may be also found in the *Bibliotheca Cisterciensis*, and *Bibliotheca Patrum*. His principal works is the *Speculum charitatis*. Leland, Bale, and Pits, mention several manuscripts which never were published.

AILSA, an insulated rock on the western coast of Scotland, between the shores of Airshire and Cantire. It is two miles in circumference at the base, is accessible only at one place, and rises to a great height in a pyramidal form. A few goats and rabbits pick up a subsistence among the short grass and furze; but the importance of the rock consists in the great variety and boundless numbers of birds, by which it is frequented, particularly the gannets or solan-geese, whose young are used at the best tables, and bring a good price. Other birds are caught for their feathers. The rock is rented from the Earl of Cassilis at L. 33 per annum. The depth of water around the base is from 7 to 48 fathoms. It is surrounded with excellent banks, well stocked with cod and other white fish.

AINSWORTH (Dr Henry), an eminent nonconformist divine, who, about the year 1590, distinguished himself among the Brownists; which drew upon him such troubles that he was obliged to retire to Holland, and became minister of a church at Amsterdam. His skill in the Hebrew language, and his excellent Annotations on the Holy Scriptures, which are still highly esteemed, gained him great reputation. He also wrote several pieces in defence of the Brownists, and several other works.

AINSWORTH (Robert), born at Woodyale in Lancashire in 1660, was master of a boarding-school at Bethnal-Green, from whence he removed to Hackney, and to other places in the neighbourhood of London. After acquiring a moderate fortune, he retired, and lived privately till the time of his death, which happened in 1743. We are indebted to him for the best Latin and English Dictionary extant: he published it in quarto 1736; and in 1752, the fourth edition, under the care of Dr Ward of Gresham College, and the Rev. William Younge, was enlarged to two vols folio.

AIR, in natural philosophy, a thin, fluid, elastic, transparent, ponderous, compressible, and dilatable body, surrounding the terraqueous globe to a considerable height. See **AEROLOGY**, **ATMOSPHERE**, and **PNEUMATICS**.

Impregnation of Water with Fixed Air, and with Sulphureous Air. See MINERAL Waters.

AIR, in medicine, &c. makes one of the six non-naturals.—From observations on bleeding in rheumatisms, and after taking cold, it is evident the air can enter with all its qualities, and vitiate the whole texture of the blood and other juices.—From the palsies, vertigoes, and other nervous affections caused by damps, mines, &c. it is evident, that air thus qualified can relax and obstruct the whole nervous system. And from the colics, fluxes, coughs, and consumptions produced by damp, moist, and nitrous air, it is evident it can corrupt and spoil the noble organs, &c.

Circulation of Air in Rooms. To render the circulation of air sensible, let the air of a room be heated by a strong fire, whilst the air of a contiguous room is cold; then let the door between these two rooms be opened, in which case the hot air of one room being lighter, will pass through the upper part of the opening of the door into the cold room; and, on the contrary, the cold

Ailfa
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Air.

Air. cold air of the other room being heavier, will pass into the former room through the lower part of the opening; accordingly, it will be found, that applying a lighted candle at the top, in the middle, and at the lower part of the opening between the two rooms, a strong current of air will appear to pass from the hot into the cold room near the top; a contrary current of air will appear to pass from the latter into the former room near the lower part of the said opening; whilst in the middle there is little or no motion at all, as may be clearly perceived by the direction of the flame of the candle.

It is for the same reason that when the fire is lighted in a chimney, a strong current of air is occasioned to enter the room, which may be felt by applying the hand near the key-hole, or other such small openings, if the doors and windows are shut; for the air over the fire being heated, becomes lighter, and ascends into the chimney, consequently other colder air must supply its place, which forces its way through all the small openings it can find. Were a room with a fire in it to be perfectly closed, excepting the chimney, the air in it would soon become unwholesome for respiration, and the fire would be soon extinguished, besides other inconveniences. Hence it appears, that those persons mistake who expect to keep the air of a room sweet and wholesome, especially for convalescents, by accurately stopping all the smallest openings that admit fresh air. When the current of air that enters into a room is on some side of it where it falls immediately upon the persons who sit in the room, then it may be offensive, especially to delicate constitutions. In that case, such opening should be closed: but at the same time another opening should be made for admitting fresh air, in another more convenient part; for a circulation of air, especially in rooms where a fire is kept, is not only salutary and useful, but is absolutely necessary.

In an ingenious publication, intitled, *A Practical Treatise on Chimneys*, there are the following remarks relating to the properest method of admitting air into a room, and of expelling the contaminated air. The author, directing to make a vent-hole near the top of the room, in order to expel the heated and contaminated air, "this," says he, "might be done by means of a small tube opening into the room, either in or near the ceiling; which might either be carried to the top of the building, or be made to communicate with the external air by a small perforation through the wall at the roof of the room; by means of either of which, a proper circulation would be established, and the foul air be carried off."

Nº 9.

Air. "For the fire would no sooner have warmed any particles of air within the room, than these would be greatly expanded, and rise immediately upwards, so as to fill the higher parts of the room with rarefied air; and as other particles would be successively heated and rarefied in their turn, by their expansive force they would press upon the sides of the apartment in every place, so as to force the lightest particles through the opening left for that purpose in the top of the room: by which means the foulest air would be gradually drawn off, without descending again into the lower regions to the annoyance of the company."

But in order to admit fresh air into the room, "Let," says he, "another opening be made in the ceiling of the room, having a communication with a small pipe that should lead from thence either to the outside of the wall, or to any other part of the building that might be judged more convenient, where it should be bent, and conducted downwards, till it reached the ground; where it should be left open, to communicate with the external air.—In this situation the cool external air would be forced in at the lower opening of the tube, and made to ascend into the apartment in proportion to the quantity that escaped towards the higher regions by means of the ventilator. And as that weighty air would no sooner enter the room than it would tend towards the floor by its own natural gravity, it would gradually mix with the heated air in its descent—become, in some measure, warmed by that means, and equally dispersed through the room, so as slowly and imperceptibly to reach the candles and the company in the room, and supply them with a sufficient quantity of fresh and wholesome air, without the inconveniences to which the company are subjected by the usual way of admitting fresh air (A). For if it enters near the floor of the apartment, it is hurried along in a rapid undivided stream towards the fire-place, and striking upon the legs and inferior parts of the body, affects them with a strong sensation of cold. To overcome the effects of this, large fires must be kept; by which other parts of the body are warmed to an extraordinary degree, which is productive of most of those disorders that are pernicious to the young, and often prove fatal to the old, during the winter season, in these cold regions."

"Thus might our apartments be kept constantly and moderately, and equally warm, at a moderate expence, without endangering our health on the one hand, by respiring a confined, stagnant, and putrid air, or, on the other hand, by subjecting ourselves to such danger of catching colds, consumptions, and rheumatic complaints, by being exposed to such exceedingly unequal

(A) Such readers as have been little accustomed to speculations of this sort, will be at a loss to comprehend in what manner two holes, both of them in the roof of the room, and communicating with the air, without any valve, or other contrivance, for opening or closing of themselves, should yet answer the two very opposite purposes; one, of constantly bringing cool air into the room without emitting any warm air—and the other, of as constantly emitting warm and admitting no cool air. They will please to advert, that the one of these tubes communicates with the atmosphere at the bottom of the house, and the other towards the top: the opening of the one is beneath the level of the room, that of the other above it. Now, as the air is more dense at the surface of the ground than at any height above it, the warm rarefying air will naturally issue at that opening where it meets with least resistance, which must invariably be through that which opens to the external air at the greatest height; and as the cool air will naturally be pressed into the room by that opening where the air is most weighty, this must invariably be by that which is nearest the surface of the earth.

Air
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Air-gun.

equal degrees of heat and cold, as are unavoidable where our apartments are so open as to admit a ready passage to the external air during the winter-season.

"The reader will easily perceive, that all that has been here said has a reference only to those apartments in cold climates, and rigorous weather, where fire to warm them becomes necessary. In warmer regions, or during the summer-season, there can be no objection to the wheel-ventilator in the window.—It is a simple contrivance, and a safe and effectual mean of preserving the air in our apartments sweet and wholesome at that season."

It is a vulgar error among many people, to believe that fire purifies the contaminated air, by destroying the noxious particles mixed with it; and for this reason they think, that the fire kept in a room where the air is tainted, purifies the room, by rendering the air in it again fit for respiration. Indeed, a fire kept in a room or apartment where the air is tainted, as is the case with hospitals, goals, and the like, does certainly purify the apartment, and the practice is very useful; but this effect is only because the fire promotes the circulation of the air, and dries the dampness of rooms, furniture, &c.: so that it is not the infected air that is purified, but is new, fresh, and wholesome air, that by the action of the fire has taken the place of the infected air; which infected air, being rarefied by the heat, has been expelled from the apartment. Fire and combustion in general is so far from purifying contaminated air, that it actually contaminates a prodigious quantity of it in a short time; so that not only a common fire, but even a lighted candle, when kept in a well-closed room, wherein the external air has not a free access, instead of purifying, renders the air of that room noxious.

Instrument for ascertaining the Purity or Wholesomeness of respirable Air. See EUDIOMETER.

AIR BALLOONS, a general name given to bags of any light substance filled with inflammable air, or other permanently elastic fluid, whose specific gravity is considerably less than that of common atmospheric air. The consequence of their being filled in this manner is, that if they are of any considerable magnitude, they ascend in the air to an amazing height; and will not only ascend in this manner by themselves, but carry up along with them great weights, and continue to rise till they attain an height in which the circumambient air is of the same specific gravity with themselves. In this situation they will either float or be driven in the direction of the wind or current of air in which they are exposed, remaining in these elevated regions till the fluid escapes by the bursting of the bags from the superior elasticity of the fluid, or by its gradual evaporation through the pores of the envelope. The history, principles, &c. of those machines are detailed under the article AEROSTATION.

Air-Bladder, in fishes. See COMPARATIVE ANATOMY, chap.iii. and ICTHYOLOGY.

Plate VII. *Air-Gun, a pneumatic machine for exploding bullets, &c. with great violence.*

The common air-gun is made of brass, and has two barrels; the inside barrel A, fig. 8. which is of a small bore, from whence the bullets are exploded; and a large barrel ECDR on the outside of it. There is a syringe SMNP fixed in the stock of the gun, by which the

VOL. I. Part I.

air is injected into the cavity between the two barrels through the valve EP. The ball K is put down into its place in the small barrel, with the hammer, as in any other gun. At SL is another valve, which, being opened by the trigger O, permits the air to come behind the bullet, so as to drive it out with great force. If this valve be opened and shut suddenly, one charge of condensed air may be sufficient for several discharges of bullets; but if the whole air be discharged on one single bullet, it will drive it out with a great force. This discharge is effected by means of a lock, fig. 9. placed here as usual in other guns; for the trigger being pulled, the cock will go down and drive the lever O, fig. 8. which will open the valve, and let in the air upon the bullet K.

Air-guns of late years have received very great improvements in their construction. Fig. 10. is a representation of one made by the late Mr B. Martin of London, and now by several of the mathematical instrument and gun makers of the metropolis. For simplicity and perfection it exceeds any other heretofore contrived. A is the gun-barrel, with the lock, stock, ram-rod, and of the size and weight of a common fowling-piece. Under the lock, at b, is a round steel tube, having a small moveable pin in the inside, which is pushed out when the trigger a is pulled, by the spring-work within the lock; to this tube b, a hollow copper-ball c screws, perfectly air-tight. This copper ball is fully charged with condensed air by the syringe B (fig. 7.) previous to its being applied to the tube b of fig. 10. It is then evident, that if a bullet be rammed down in the barrel, the copper ball screwed fast at b, and the trigger a be pulled, that the pin in b will, by the action of the spring-work within the lock, forcibly strike out into the copper ball; and thereby pushing in suddenly a valve within the copper ball, let out a portion of the condensed air; which air will rush up thro' the aperture of the lock, and forcibly act against the bullet, driving it to the distance of 60 or 70 yards or further. If the air is strongly condensed at every discharge, only a portion of the air escapes from the ball; therefore, by re-cocking the piece, another discharge may be made; and this repeated to the amount of 15 or 16 times. An additional barrel is sometimes made, and applied for the discharge of shot, instead of the one above described.

The air in the copper ball is condensed by means of the syringe B (fig. 7.), in the following manner: The ball c is screwed quite close on the top of the syringe at b, at the end of the steel-pointed rod: a is a stout ring through which passes the rod k: upon this rod the feet should be firmly set; then the hands are to be applied to the two handles ii, fixed on the side of the barrel of the syringe. Now by moving the barrel B steadily up and down on the rod a, the ball c will become charged with condensed air; and it may be easily known when the ball is as full as possible, by the irresistible action that the air makes against the piston when you are working the syringe. At the end of the rod k is usually a four-square hole, which with the rod serves as a key to fasten the ball c fast on the screw b of the gun and syringe close to the orifice in the ball c. In the inside is fixed a valve and spring, which gives way for the admission of air; but upon its emission comes close up to the orifice, shutting up the internal

U u

air.

Air-gun. air. The piston-rod works air-tight, by a collar of leather on it, in the barrel B; it is therefore plain, when the barrel is drawn up, the air will rush in at the hole *b*. When the barrel is pushed down, the air therein contained will have no other way to pass from the pressure of the piston but into the ball *c* at top. The barrel being drawn up, the operation is repeated, until the condensation is so strong as to resist the action of the piston.

Sometimes the syringe is applied to the end of the barrel C (see fig. 11.); the lock and trigger shut up in a brass case *d*; and the trigger pulled, or discharge made, by pulling the chain *b*. In this contrivance there is a round chamber for the condensed air at the end of the syringe at *e*, and it has a valve acting in a similar manner to that of the copper ball. When this instrument is not in use, the brass case *d* is made to slide off, and the instrument then becomes a walking-stick; from which circumstance, and the barrel being made of cane, brass, &c. it has received the appellation of the *Air-cane*. The head of the cane unscrews and takes off at *a*, where the extremity of the piston-rod in the barrel is shown: an iron rod is placed in a ring at the end of this, and the air condensed in the barrel in a similar manner to that of the gun as above; but its force of action is not near so strong and permanent as that of the latter.

The *Magazine Air-gun* was invented by that ingenious artist L. Colbe. By this contrivance ten bullets are so lodged in a cavity, near the place of discharge, that they may be drawn into the shooting-barrel, and successively discharged so fast as to be nearly of the same use as so many different guns.

Fig. 12. represents the present form of this machine, where part of the stock is cut off, to the end of the injecting syringe. It has its valve opening into the cavity between the barrels, as before. K K is the small shooting-barrel, which receives the bullets from the magazine E D, which is of a serpentine form, and closed at the end D when the bullets are lodged in it. The circular part *a b c*, is the key of a cock, having a cylindric hole through it, *i k*, which is equal to the bore of the same barrel, and makes a part of it in the present situation. When the lock is taken off, the several parts Q, R, T, W, &c. come into view, by which means the discharge is made by pushing up the pin Pp, which raises and opens a valve V, to let in the air against the bullet I, from the cavity F F; which valve is immediately shut down again by means of a long spring of brass N N. This valve V being a conical piece of brass, ground very true in the part which receives it, will of itself be sufficient to confine the air.

To make a discharge, you will pull the trigger ZZ, which throws up the sear *y a*, and disengages it from the notch *a*, upon which the strong spring W W moves the tumbler T, to which the cock is fixed. This, by its end *u*, bears down the end *v* of the tumbling lever R, which, by the other end *m*, raises at the same time the flat end of the horizontal lever Q; and by this means, of course, the pin Pp, which stands upon it, is pushed up, and thus opens the valve V, and discharges the bullet. This is all evident from a bare view of the figure.

To bring another bullet to succeed that marked I, instantaneously, turn the cylindric cavity of the key of

the cock, which before made part of the barrel K K, into the situation *i k*, so that the part *i* may be at K; and hold the gun upon your shoulder, with the barrel downwards and the magazine upwards, by which means that bullet next the cock will fall into it out of the magazine, but go no farther into this cylindric cavity than the two little springs *ss*, which detain it. The two circles represent the cock-barrel, wherein the key abovementioned turns upon an axis not represented here, but visible in fig. 13. This axis is a square piece of steel, on which comes the square hole of the hammer H, fig. 14; by which the cylindric cavity mentioned is opened to the magazine. Then opening the hammer, as in that figure, the bullet is brought into its proper place near the discharge-valve, and the cylindric cavity of the key of the cock again makes part of the inward barrel K K.

It evidently appears how expeditious a method this is of charging and discharging a gun; and were the force of condensed air equal to that of gun-powder, such an air-gun would answer the end of several guns.

In the air-gun, and all other cases where the air is required to be condensed to a very great degree, it will be requisite to have the syringe of a small bore, viz. not exceeding half an inch in diameter; because the pressure against every square inch is about 15 pounds, and therefore against every circular inch about 12 pounds. If therefore the syringe be one inch in diameter, when one atmosphere is injected, there will be a resistance of 12 pounds against the piston; and when 10 are injected, there will be a force of 120 pounds to be overcome; whereas 10 atmospheres act against the circular half-inch piston (whose area is only one-fourth part so big) with only a force equal to 30 pounds; or 40 atmospheres may be injected with such a syringe, as well as 10 with the other. In short, the facility of working will be inversely as the squares of the diameter of the syringe.

Air-Jacket, a sort of jacket made of leather, in which are several bags, or bladders, composed of the same materials, communicating with each other. These are filled with air through a leather tube, having a brass stop-cock accurately ground at the extremity, by which means the air blown in through the tube is confined in the bladders. The jacket must be wet, before the air be blown into the bags, as otherwise it will immediately escape through the pores of the leather. By the help of these bladders, which are placed near the breast, the person is supported in the water, without making the efforts used in swimming.

Air-Pipes, an invention for drawing foul air out of ships, or any other close places, by means of fire. These pipes were first found out by one Mr Sutton, a brewer in London; and from him have got the name of *Sutton's Air-pipes*. The principle on which their operation depends is known to every body, being indeed no other than that air is necessary for the support of fire; and, if it has not access from the places most adjacent, will not fail to come from those that are more remote. Thus, in a common furnace, the air enters through the ash-hole; but if this is closed up, and a hole made in the side of the furnace, the air will rush in with great violence through that hole. If a tube of any length whatever is inserted in this hole, the air will rush through the tube into the fire, and of

Air gun
||
Air-pipes.

2^d Fig. 1.

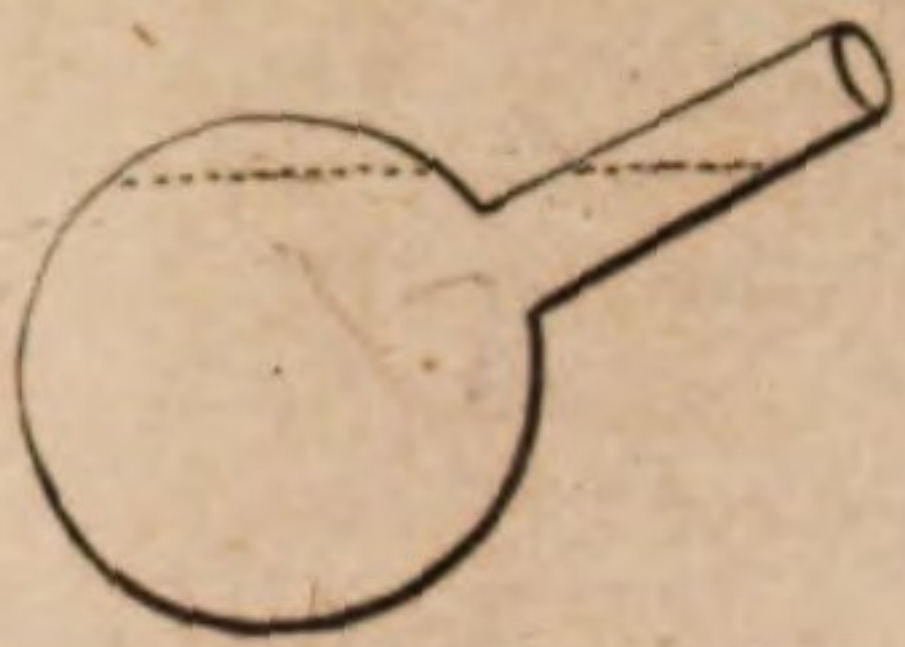


Fig. 2.



Fig. 3.



Fig. 4.

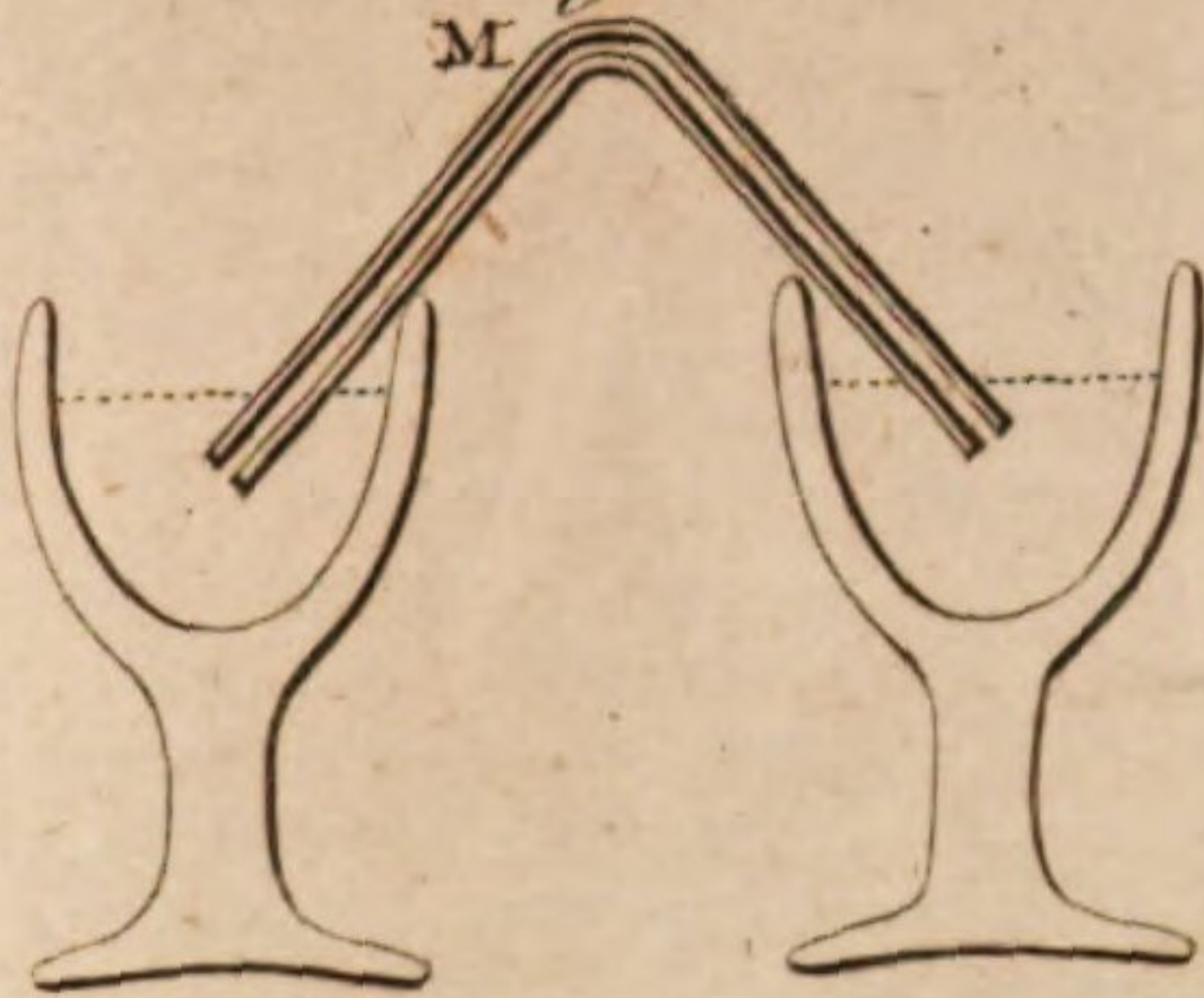


Fig. 5.

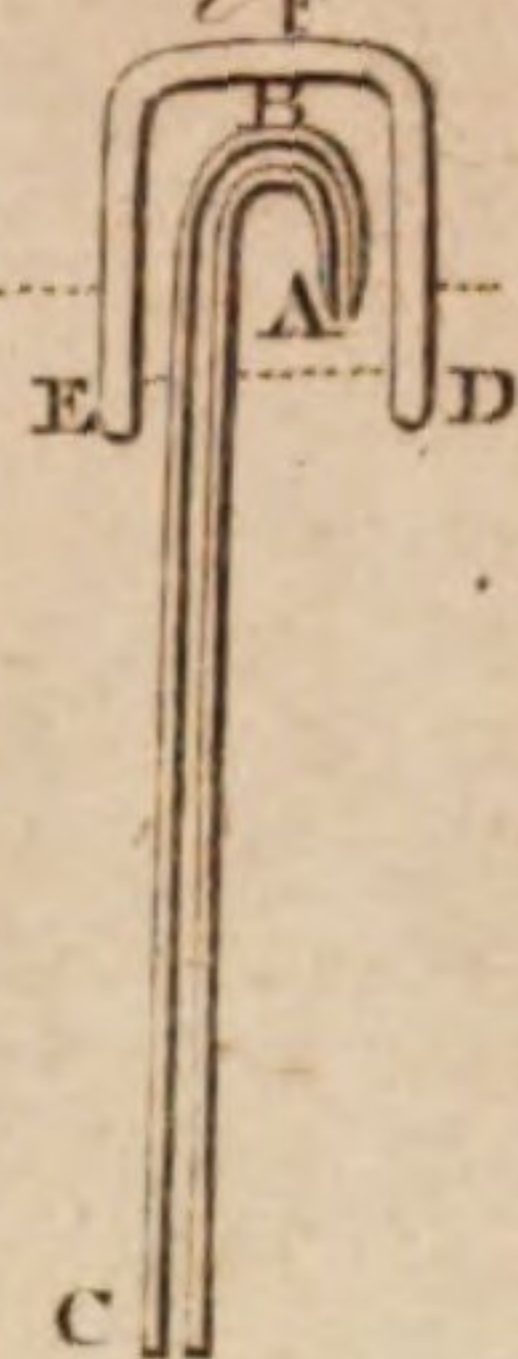


Fig. 6.

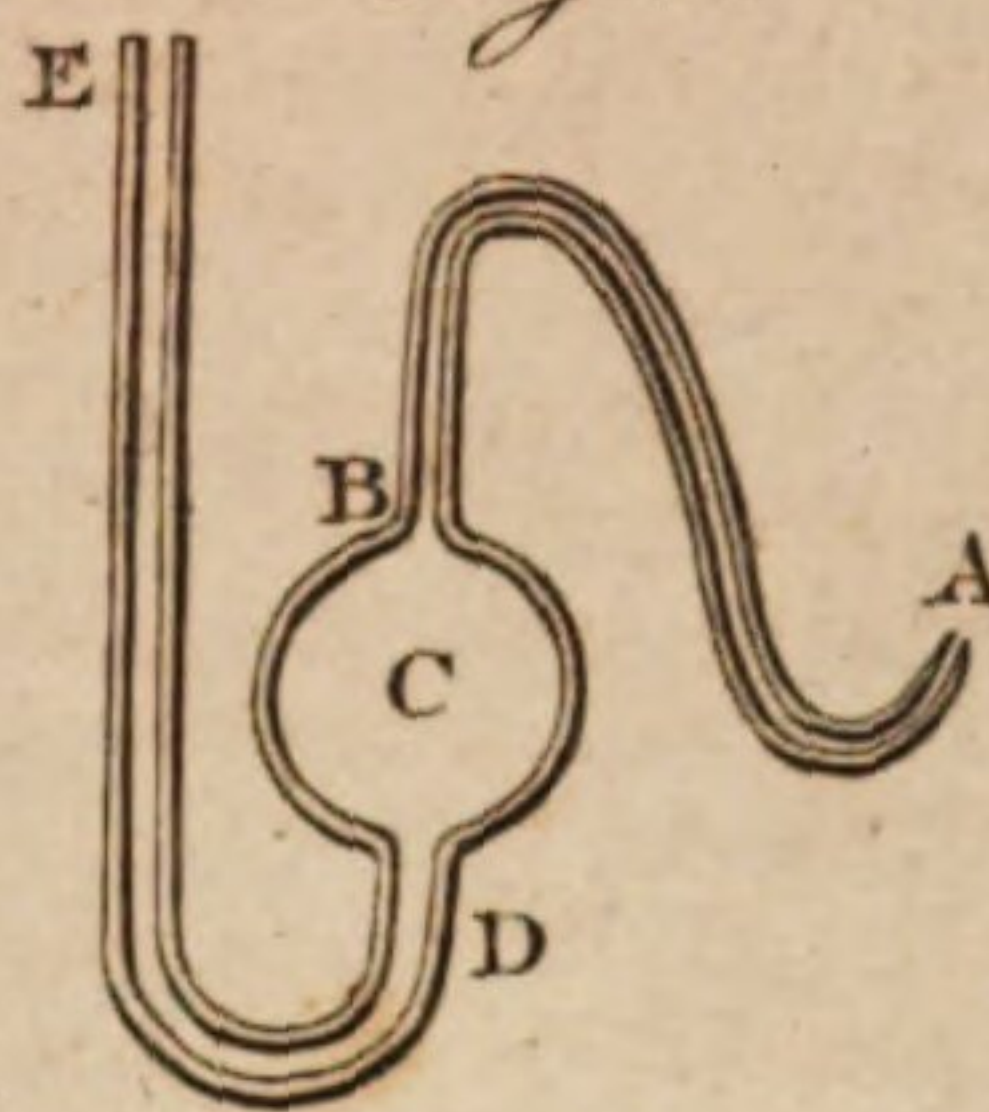


Fig. 1.



Fig. 7.

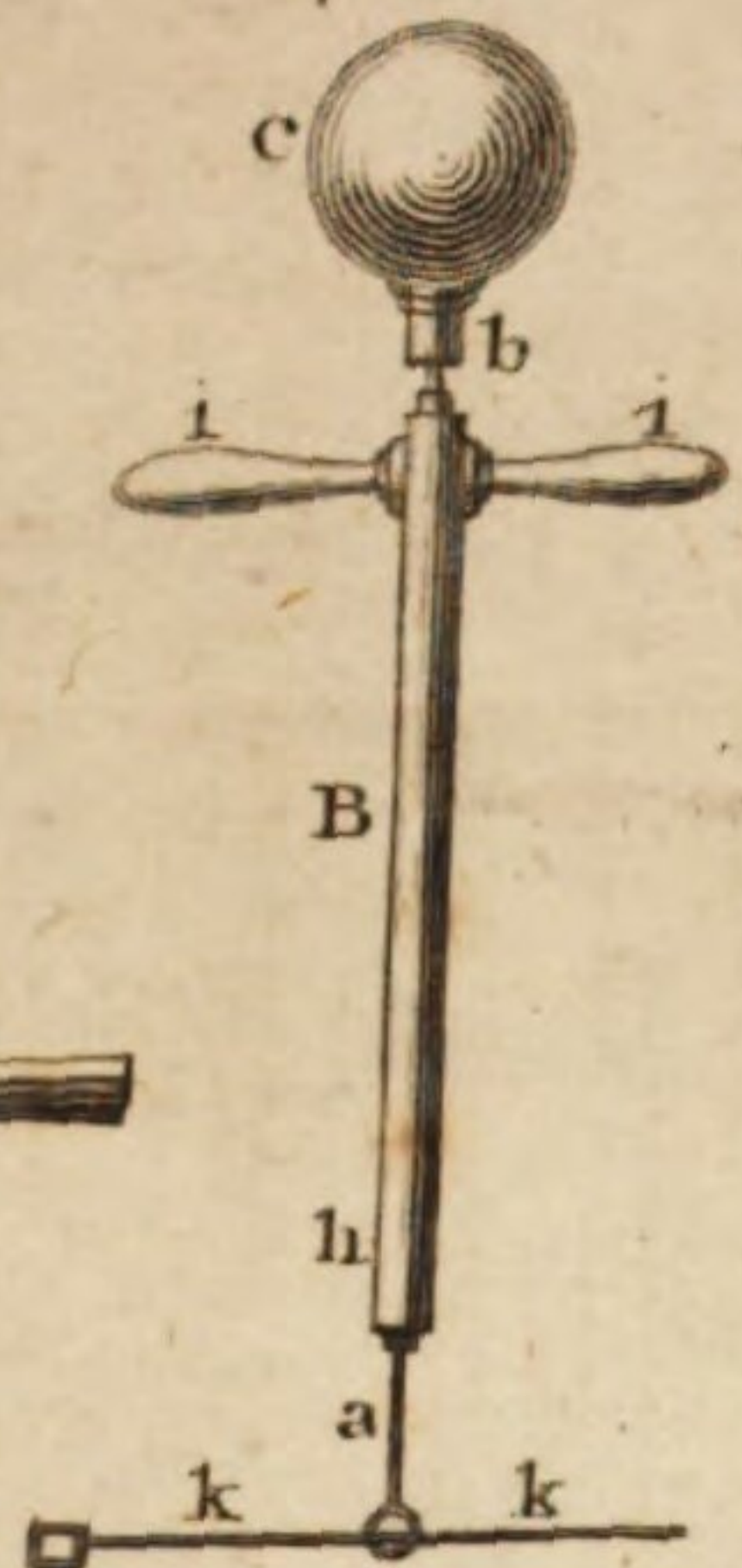


Fig. 8. Air Gun.



Fig. 10. Improved Air Gun.

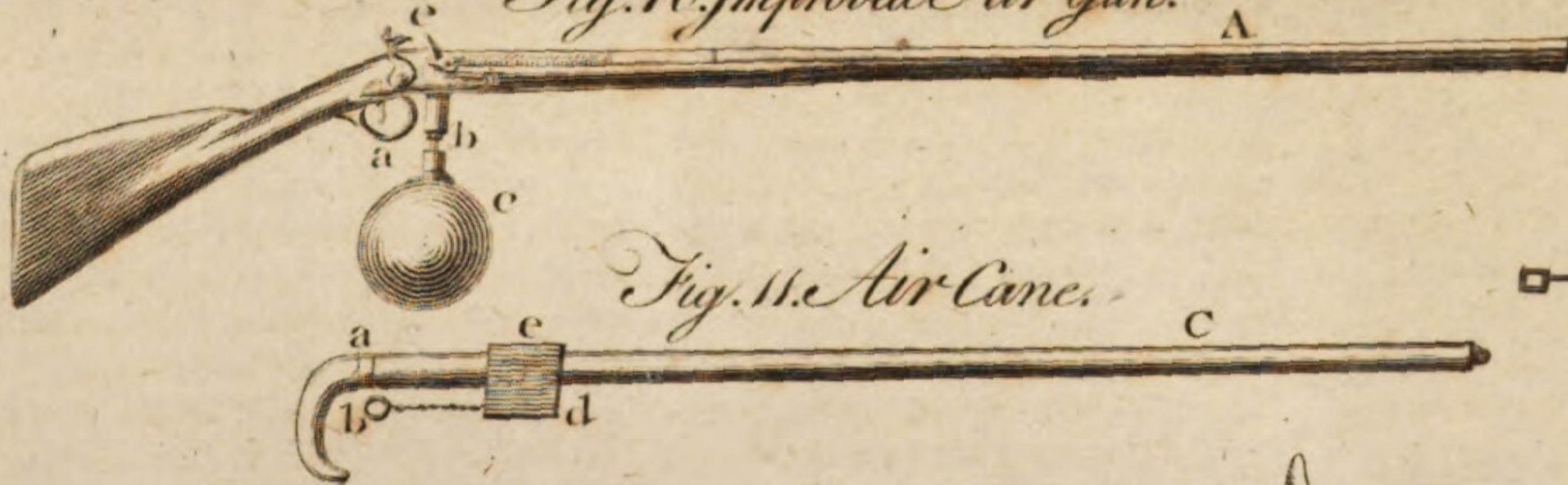


Fig. 9.



Fig. 11. Air Cane.

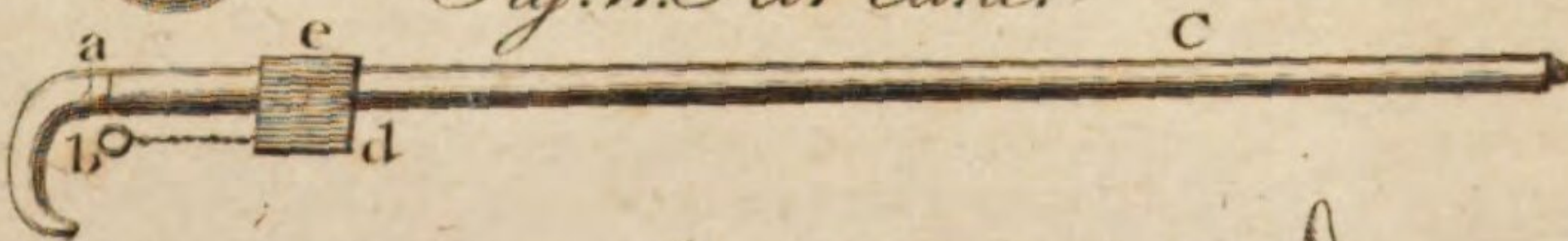


Fig. 12. Magazine Air Gun.

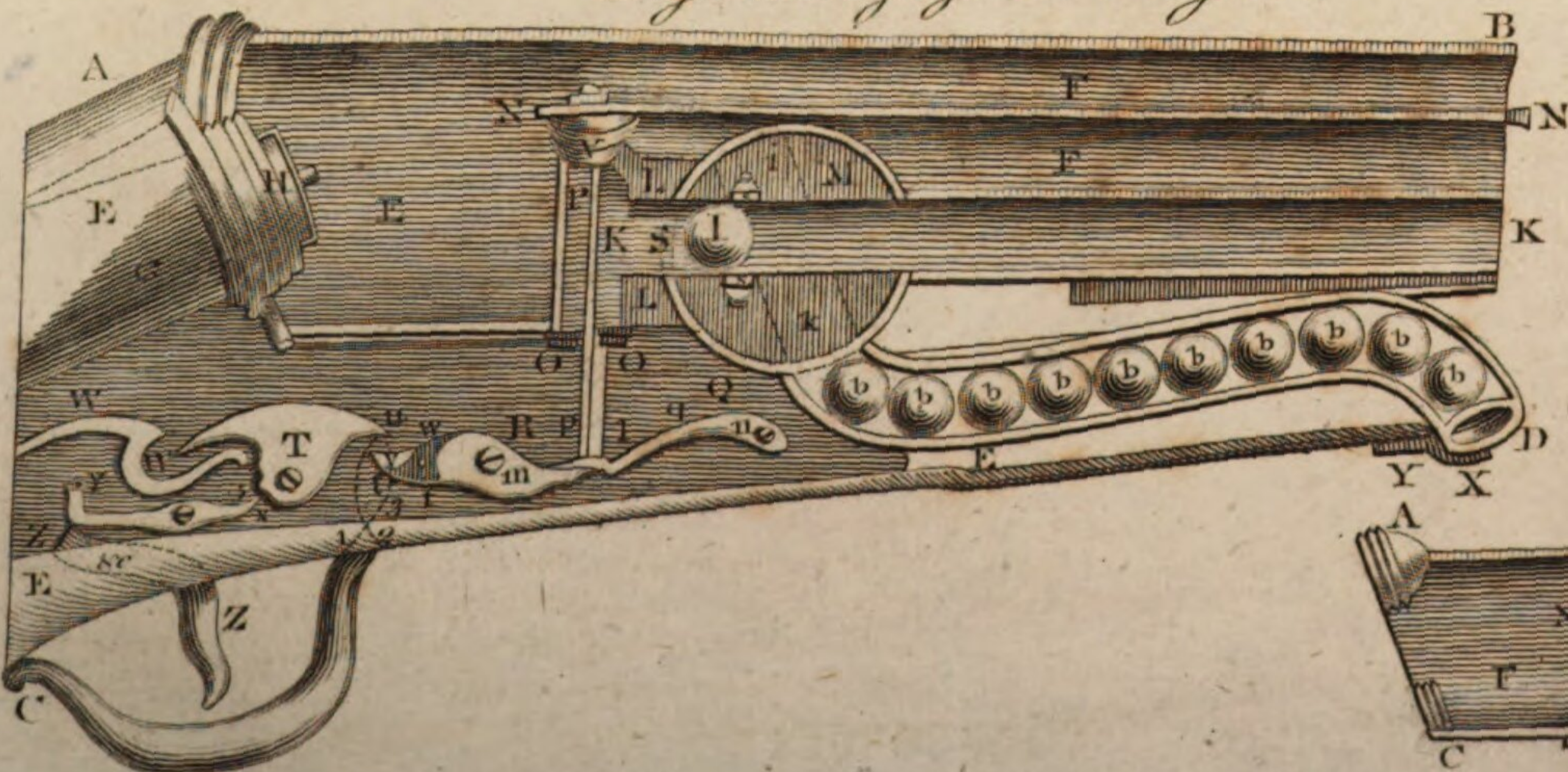


Fig. 13.

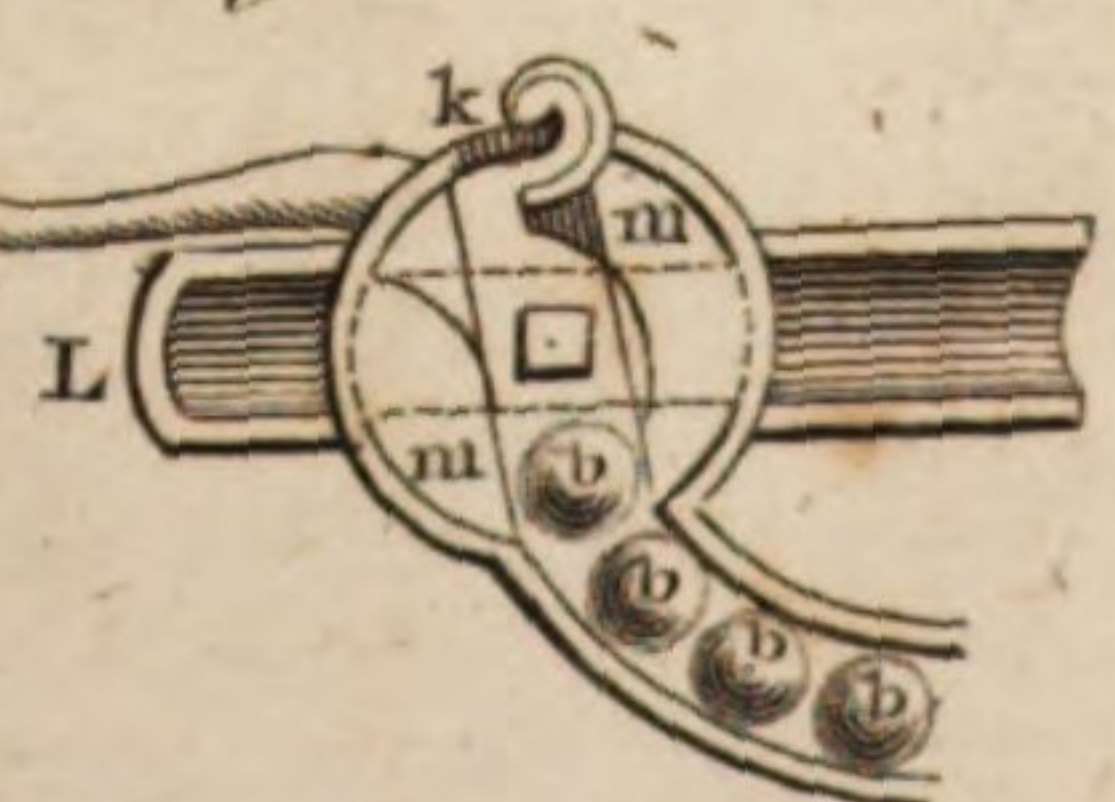
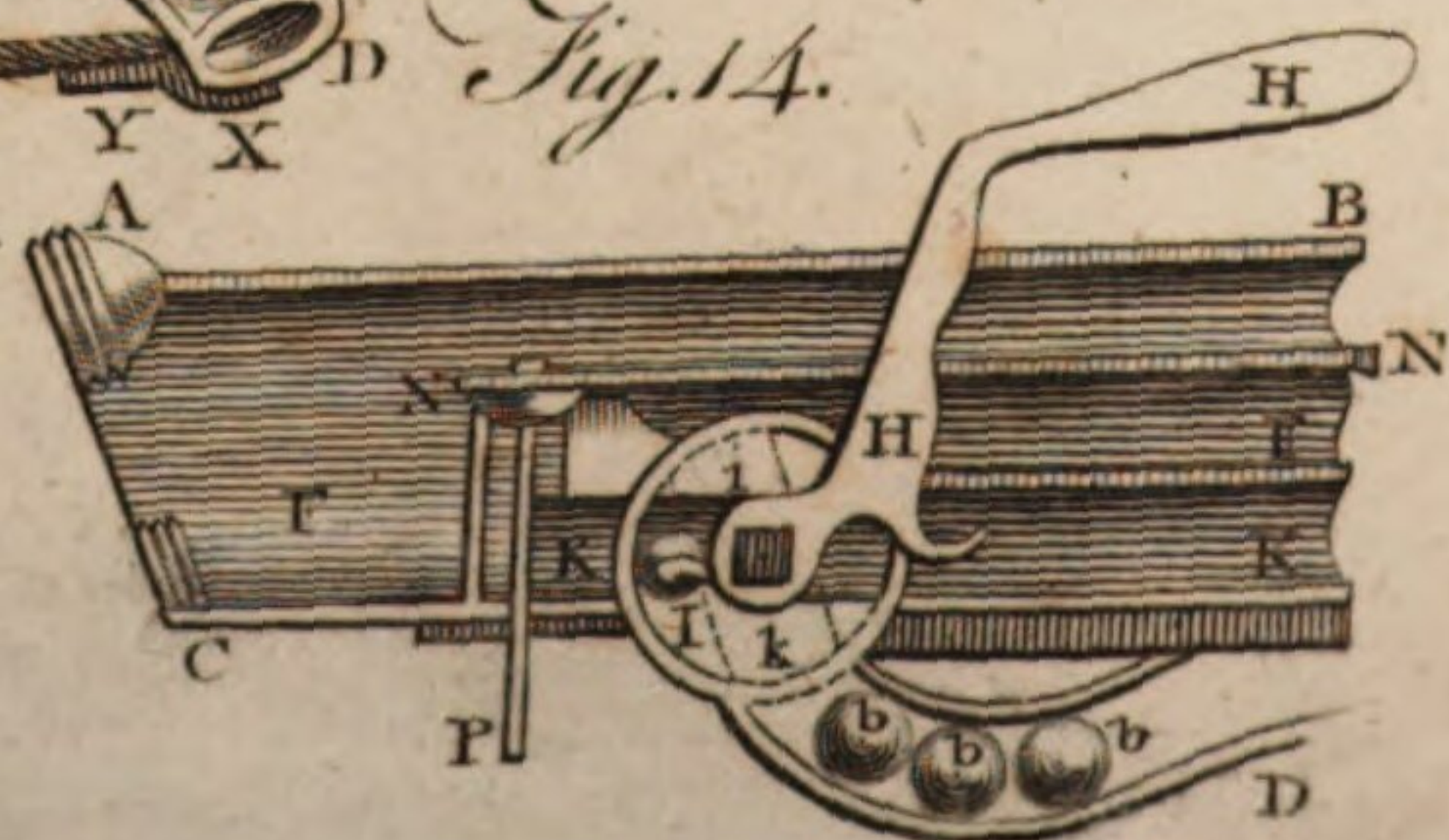


Fig. 14.



Air-pipes. consequence there will be a continued circulation of air in that place where the extremity of the tube is laid. Mr Sutton's contrivance then, as communicated to the Royal Society by Doctor Mead, amounts to no more than this.—“As, in every ship of any bulk, there is already provided a copper or boiling-place proportionable to the size of the vessel; it is proposed to clear the bad air, by means of the fire already used under the said coppers or boiling-places for the necessary uses of the ship.

“It is well known, that, under every such copper or boiler, there are placed two holes, separated by a grate; the first of which is for the fire, and the other for the ashes falling from the same; and that there is also a flue from the fire place upward, by which the smoke of the fire is discharged at some convenient place of the ship.

“It is also well known, that the fire once lighted in these fire-places, is only preserved by the constant draught of air through the forementioned two holes and flue; and that if the said two holes are closely stopped up, the fire, though burning ever so briskly before, is immediately put out.

“But if, after shutting up the abovementioned holes, another hole be opened, communicating with any other room or airy place, and with the fire; it is clear, the said fire must again be raised and burn as before, there being a like draught of air through the same as there was before the stopping up of the first holes; this case differing only from the former in this, that the air feeding the fire will now be supplied from another place.

“It is therefore proposed, that, in order to clear the holds of ships of the bad air therein contained, the two holes abovementioned, the fire-place and ash-place, be both closed up with substantial and tight iron-doors; and that a copper or leaden pipe, of sufficient size, be laid from the hold into the ash-place, for the draught of air to come in that way to feed the fire. And thus it seems plain, from what has been already said, that there will be, from the hold, a constant discharge of the air therein contained; and consequently, that that air, so discharged, must be as constantly supplied by fresh air down the hatches or such other communications as are opened into the hold; whereby the same must be continually freshened, and its air rendered more wholesome and fit for respiration.

“And if into this principal pipe so laid into the hold, other pipes are let in, communicating respectively either with the well or lower decks; it must follow, that part of the air, consumed in feeding the fire, must be respectively drawn out of all such places to which the communication shall be so made.”

This account is so plain, that no doubt can remain concerning the efficacy of the contrivance: it is evident, that, by means of pipes of this kind, a constant circulation of fresh air would be occasioned thro' those places where it would otherwise be most apt to stagnate and putrefy. Several other contrivances have been used for the same purpose; and Doctor Hales's ventilators, by some unaccountable prejudice, have been reckoned superior in efficacy and even simplicity to Mr Sutton's machine, which at its first invention met with great opposition*, and even when introduced by Dr Mead,

who used all his interest for that purpose, was shamefully neglected. Air-pipes.

A machine capable of answering the same purpose was invented by Mr Defaguliers, which he called the *ship's lungs*. It consisted of a cylindrical box set up on its edge, and fixed to a wooden pedestal. From the upper edge of the box issued a square trunk open at the end, and communicating with the cavity of the box. Within this box was placed a cylindrical wheel turning on an axis. It was divided into 12 parts, by means of partitions placed like the radii of a circle. These partitions did not extend quite to the centre, but left an open space of about 18 inches diameter in the middle; towards the circumference, they extended as far as possible without interfering with the case, so that the wheel might always be allowed to turn freely.—Things being thus circumstanced, it is plain, that if the wheel was turned towards that side of the box on which the trunk was, every division would push the air before it, and drive it out through the trunk, at the same time that fresh air would come in through the open space at the centre, to supply that which was thrown out thro' the trunk. By turning the wheel swiftly, a strong blast of air would be continually forced out thro' the square trunk, on the same principles on which a common faner winnows corn. If the wheel is turned the opposite way, a draught of air may be produced from the trunk to the centre. If this machine, then, is placed in a room where a circulation of air is wanted, and the trunk made to pass through one of the walls; by turning the wheel swiftly round, the air will be forced with great velocity out of that room, at the same time that fresh air will enter through any chinks by which it can have access to supply that which has been forced out.

It is evident, that the circulation which is promoted by this machine, is entirely of the same kind with that produced by Mr Sutton's; the turning of the wheel in Mr Defagulier's machine being equivalent to the rarefaction of the air by fire in Mr Sutton's: but that the latter is vastly superior, as acting of itself, and without intermission, requires no arguments to prove. Mr Sutton's machine has yet another conveniency, of which no other contrivance for the same purpose can boast; namely, that it not only draws out putrid air, but destroys it by causing it pass through fire; and experience has abundantly shown, that though putrid air is thrown into a great quantity of fresh air, it is so far from losing its pernicious properties, that it often produces noxious diseases. We do not say, indeed, that putrid air becomes salutary by this means; but it is undoubtedly rendered less noxious than before; tho' whether it is equally innocent with the smoke of a fire fed in the common way, we cannot pretend to determine.

Besides this machine by Mr Defaguliers, the ventilators of Dr Hales, already mentioned, and those called *wind-sails*, are likewise used for the same purpose. The former of which is an improvement of the Hessian-bellows*: the other is a contrivance for throwing fresh air into those places where putrid air is apt to lodge; but this has the last-mentioned inconvenience in a much greater degree than any of the others, as the blast of fresh air throws out that which was rendered putrid by stagnation, in such a manner as to contaminate all around it. See *WIND-Sails*.

* See Sutton.

Air-trunk
||
Air-shafts.

Air-Trunk, is also a contrivance by Doctor Hales to prevent the stagnation of putrid effluvia in jails, and other places where a great number of people are crowded together in a small space. It consists only of a long square trunk open at both ends; one of which is inserted into the ceiling of the room, the air of which is required to be kept pure; and the other extends a good way beyond the roof. Through this trunk a continued circulation is carried on: and the reason is, that the putrid effluvia which do so much mischief when collected, being much lighter than the pure atmosphere, arise to the top of the room; and, if they there find a vent, will continually go out through it. These effluvia arise in very considerable quantity, being calculated by the late Dr Keil at no less than 39 ounces from one man in 24 hours.

These trunks were first made trial of by Mr Yeoman, over the House of Commons, where they were nine inches wide within; and over the Court of King's-bench in Westminster-hall, where they were six inches wide. They are sometimes made wider, and sometimes narrower: but the wider they are the longer they ought to be, more effectually to promote the ascent of the vapour. The reason why vapours of this kind ascend more swiftly through a long trunk than a short one, is, that the pressure of fluids is always according to their different depth, without regard to the diameter of their basis, or of the vessel which contains them; and, upon this principle, a gallon of water may be made to split a strong cask. See *HYDROSTATICS*. When the column of putrid effluvia is long and narrow, the difference between the column of atmosphere pressing on the upper end of the trunk, and that which presses on the lower end, is much greater than if the column of putrid effluvia was short and wide; and consequently the ascent is much swifter.—One pan of a single pair of scales, which was two inches in diameter, being held within one of these trunks over the House of Commons, the force of the ascending air made it rise so as to require four grains to restore the equilibrium, and this when there was no person in the house; but when it was full, no less than 12 grains were requisite to restore the equilibrium; which clearly shows that these trunks must be of real and very great efficacy.

Air-Pump, a machine by which the air contained in a proper vessel may be exhausted or drawn out. See the article *PNEUMATICS*.

Air-Sacs, in birds. See *COMPARATIVE ANATOMY*, chap. ii.

Air-Shafts, among miners, denote holes or shafts let down from the open air to meet the adits and furnish fresh air. The damps, want, and impurity of air which occur, when adits are wrought 30 or 40 fathoms long, make it necessary to let down air-shafts, in order to give the air liberty to play through the whole work, and thus discharge bad vapours, and furnish good air for respiration: the expence of which shafts, in regard of their vast depths, hardness of the rock, drawing of water, &c. sometimes equals, nay exceeds, the ordinary charge of the whole adit.

Sir Robert Murray describes a method, used in the coal-mines at Liege, of working mines without air-shafts.

When the miners at Mendip have sunk a groove, they will not be at the charge of an air-shaft till

they come at ore; and for the supply of air have boxes of elm exactly closed, of about six inches in the clear, by which they carry it down about twenty fathoms. They cut a trench at a little distance from the top of the groove, covering it with turf and rods disposed to receive the pipe, which they contrive to come in sideways to their groove, four feet from the top; which carries down the air to a great depth. When they come at ore, and need an air-shaft, they sink it four or five fathoms distant, according to the convenience of the breadth, and of the same fashion with the groove, to draw as well ore as air.

Air-Threads, in natural history, a name given to the long filaments, so frequently seen in autumn floating about in the air.

These threads are the work of spiders, especially of that species called the long-legged field-spider; which, having mounted to the summit of a bush or tree, darts from its tail several of these threads, till one is produced capable of supporting the creature in the air: on this it mounts in quest of prey, and frequently rises to a very considerable height. See *ARANEÆ*.

Air-Vessels, are spiral ducts in the leaves, &c. of plants, supposed to be analogous to the lungs of animals, in supplying the different parts of a plant with air. See the article *PLANTS*.

AIR, in mythology, was adored by the Heathens under the names of Jupiter and Juno; the former representing the superior and finer part of the atmosphere, and the latter the inferior and grosser part. The augurs also drew presages from the clouds, thunder, lightning, &c.

AIR, in painting, &c. denotes the manner and very life of action; or it is that which expresses the disposition of the agent.—It is sometimes also used in a synonymous sense with gesture or attitude.

AIR, in music, is taken in different senses. It is sometimes contrasted with harmony; and, in this sense, it is synonymous with melody in general.—Its proper meaning is, A tune, which is set to words, or to short pieces of poetry that are called *songs*.

In operas, we give the name of *air* to such pieces of music as are formed with measures and cadences, to distinguish it from the recitative; and, in general, every piece of music is called an *air*, which is formed for the voice, or even for instruments, and adapted to stanzas, whether it forms a whole in itself, or whether it can be detached from any whole of which it forms a part, and be executed alone.

If the subject admits of harmony, and is set in parts, the *air* is, according to their number, denominated a *duett*, a *trio*, a *quartetto*, &c. We need not follow Rousseau, and the other philologists, in their endeavours to investigate the etymon of the word *air*. Its derivation, though found and ascertained, would contribute little to illustrate its meaning in that remote sense, to which, through a long continuance of time, and the various vicissitudes of language, it has now passed. The curious may consult the same article in the *Dictionnaire de Musique* by M. Rousseau.

In modern music, there are several different kinds of *airs*, each of which agrees to a certain kind of dancing, and from these dances the *airs* themselves take their specific names.

The *airs* of our operas, are, if we may be permitted the

Air-threads
||
Air.

Air.

the expression, the canvass or substratum upon which are painted all the pictures of imitative music; melody is the design, and harmony the colouring; every picturesque object selected from the most beautiful parts of nature, every reflected sentiment of the human heart, are the models which the artist imitates; whatever gains attention, whatever interests the soul, whatever charms the ear, or causes emotion in the heart, these are the objects of his imitation. See IMITATION. An air which delights the ear, and discovers the learning of the composer; an air invented by genius, and composed with taste; is the noblest effort of music: it is this which explores the compass, and displays the delicacy, of a beautiful voice; it is in this where the charms of a well-conducted symphony shine; it is by this, that the passions, excited and inflamed by nice gradations, reach and agitate the soul through the avenues of external sense. After hearing a beautiful *air*, the mind is acquiescent and serene: the ear is satisfied, not disgusted: it remains impressed on the fancy, it becomes a part of our essence, we carry it with us, we are able to repeat it at pleasure: without the ability acquired by habit to breathe a single note of it, we execute it in our imagination in the same manner as we heard it upon the theatre: one sees the scene, the actor, the theatre; one hears the accompaniments and the applauses. The real enthusiast in music never forgets the beautiful airs which he has heard; when he chooses, he causes the opera to recommence.

The words to which *airs* are adapted, are not always rehearsed in regular succession, nor spoken in the same manner with those of the recitative; and though, for ordinary, they are very short, yet they are interrupted, repeated, transposed, at the pleasure of the artist. They do not constitute a narrative, which once told is over: they either delineate a picture, which it is necessary to contemplate in different points of view; or inspire a sentiment in which the heart acquiesces with pleasure, and from which it is neither able nor willing to be disengaged; and the different phrases of the *air*, are nothing else but different manners of beholding the same image. This is the reason why the subject of an *air* should be one. It is by these repetitions properly placed, it is by these redoubled efforts, that an impression, which at first was not able to move you, at length shakes your soul, agitates you, transports you out of yourself: and it is likewise upon the same principle, that the runnings, as they are called, or those long, mazy, and inarticulated inflections of the voice, which, in pathetic *airs*, frequently seem, though they are not always so, improperly placed; whilst the heart is affected with a sentiment exquisitely moving, it often expresses its emotions by inarticulate sounds, more strongly and sensibly than it could do by words themselves.

The form of *airs* is of two kinds. The small airs are often composed of two strains, which ought each of them to be sung twice; but the important airs in operas are frequently in the form of rondeaus.

AIR, or *Ayr*, in geography, a town of Scotland, capital of an extensive county of the same name. It stands on the river Air, and was formerly a place of good trade, and seat of fisheries; all of which have vanished, and the people now live by one another. Air appears, from history and other documents, to have been a considerable place at the time of the Norman conquest. The vouchers

of its antiquity are corroborated by an elegant building, called the *Cross*, which hath escaped the destructive rage of the last and preceding century. The date on this fragment of antiquity is 1055, consequently it hath stood in its place above 730 years; and it is to be wished, that the majority of the inhabitants may unite in preserving it from being destroyed by persons who have expressed a strong desire to that purpose. In 1557, the tax levied upon Air was L. 236 Scots; upon Glasgow only L. 202. In 1771, Air was assessed at 15 s. Sterl. and Glasgow at L. 18, 10s. In 1751, the pickled herrings exported from Air were 6624 barrels; since the year 1777, none. These revolutions appear the more extraordinary, when we consider the very advantageous situation of Air both by land and water; the fertility of the country; the riches of the sea; its contiguity to the western fisheries on one side, and to Glasgow on the other; the large returns for cattle, grain, and coal; the ample revenues of the town; and particularly the conveniency of its harbour for fishing-vessels of every construction.—About a mile north from the town there is a lazaret-house, commonly called *The King's Chapel*, which King Robert de Bruce set apart for the maintenance of lepers.

AIRA, in botany: A genus of the triandria digynia class; and in the natural method ranking under the 4th order, *Gramina*. The characters are: The *calyx* is a two-flowered double-valved glume: The *corolla* is two-valved, and no rudiment of a flower between the florets: The *stamina* consist of three capillary filaments the length of the flower; the antheræ are oblong, and forked at both ends: The *pisillum* is an egg-shaped germen; the styli are two, bristly, and expanding; the stigmata are pubescent: There is no *pericarpium*; the including corolla grows to the seed: The *seed* is egg-shaped and covered. There are 14 species of the *aira*, nine of which are natives of Britain. The English name is *Hair-grass*. See the general article GRASS.

AIRANI, in church-history, an obscure sect of Arians, in the fourth century, who denied the consubstantiality of the Holy Ghost with the Father and the Son. They are otherwise called *Airanistæ*; and are said to have taken their name from one *Airas*, who distinguished himself at the head of this party, in the reigns of Valentinian and Gratian.

AIRE, a town of France, in Proper Gascony, of which it is the capital, with a bishop's see. It is seated on the river Adour, on the declivity of a mountain. E. Long. 0. 3. N. Lat. 43. 47.

AIRE, a strong town in the Netherlands, in the county of Artois, with a castle. It was taken by the French in 1710, and was confirmed to them by the treaty of Utrecht. It is seated on the river Lis, 22 miles south of Dunkirk, and communicates with St Omer's by a canal cut from the river Aa. E. Long. 2. 31. N. Lat. 50. 38.

AIRING, a term peculiarly used for the exercising horses in the open air. It purifies the blood; purges the body from gross humours; and, as the jockies express it, teaches the horse how to make his wind rake equally, and keep time with the other motions of his body. It also sharpens the stomach, and keeps the creature hungry; which is a thing of great consequence, as hunters and racers are very apt to have their stomach fall off, either from want of exercise, or from the too violent

exerc-

Aira
||
Airing.

Airs
H
Ajuga.

exercise which they are often exposed to. If the horse be over fat, it is best to air him before sun-rise and after sun-setting; and in general, it is allowed by all, that nothing is more beneficial to those creatures than early and late airings. Some of our modern managers, however, dispute this: they say, that the cold of these times is too great for the creature; and that if, in particular, he is subject to catarrhs, rheums, or the like complaints, the dews and cold fogs, in these early and late airings, will be apt to increase all those disorders. Nature, we see, also points out the sun-beams as of great use to these animals; those which are kept hardy and lie out all night, always running to those places where the sunshine comes, as soon as it appears in a morning. This should seem to recommend those airings that are to be made before sun-set, and a little time after sun-rise. As to the caution, so earnestly inculcated by Markham, of using these early and late airings for fat horses, it is found unnecessary by many: for they say, that the same effect may be produced by airings at warmer times, provided only that they are made longer; and that, in general, it is from long airings that we are to expect to bring a horse to a perfect wind and sound courage.

AIRS, in the manege, are the artificial motions of taught horses; as the demivolt, curvet, capriole, &c.

AIRY, or AERY, among sportsmen, a term expressing the nest of a hawk or eagle.

AIRY Triplicity, among astrologers, denotes the three signs, gemini, libra, and aquarius.

AISNE, a river of France, which rises in Champaign, and runs W. by Soissons in the Isle of France, falling in the river Oise, a little above Campeigne.

AITOCZU, a considerable river of Lesser Asia, which, arising in the mountain Taurus, falls into the south part of the Euxine Sea.

AJUGA, BUGLE: A genus of the gymnospermia order, belonging to the didynamia class of plants; and in the natural method ranking under the 42d order, *Asperifolia*. The characters are: The *calyx* is a short perianthium, monophyllous and persistent: The *corolla* is monopetalous and grinning: The *filamina* consist of four erect subulated filaments; the antheræ are dimidiated: The *pistillum* has a four-cleft germen, a filiform stylus, and two slender stigmata: There is no *pericarpium*; the calyx converging, and containing the seeds in its bosom: The *seeds* are four, and oblong. The

Species enumerated by Linnæus are, 1. The orientalis, with inverted flowers, which is a native of the East. 2. The genevensis, with woolly leaves and hairy cups, is a native of Switzerland and of the southern parts of Europe. 3. The pyramidalis, or mountain bugle, with a square pyramidal spike and blue flowers, is a native of Sweden, Germany, Switzerland, and the hilly parts of Britain. Sheep and goats eat it; cows are not fond of it; horses and swine refuse it. 4. The reptans, common or pasture bugle, with creeping suckers, and blue, red, or white blossoms, in long leafy spikes, is a native of the southern parts of Europe, and is met with in woods and moist places in many parts of Britain. The roots are astringent, and strike a black colour with vitriol of iron.

Culture. The first species is propagated by sowing the seeds soon after they are ripe, in a pot filled with loamy earth, and placed in a shady situation till autumn;

when it must be removed under a frame, and protected from the frosts. In the spring, after the plants are come up, let them be translated each into a separate pot, and in summer placed under a shady situation. The other sorts are easily propagated by their side-shoots, and succeed best in a moist shady situation.

AIUS LOCURIUS, the name of a deity to whom the Romans erected an altar.—The words are Latin, and signify “a speaking voice.”—The following accident gave occasion to the Romans erecting an altar to the Aius Locutius. One M. Seditius, a plebeian, acquainted the tribunes, that, in walking the streets by night, he had heard a voice over the temple of Vesta, giving the Romans notice that the Gauls were coming against them. This intimation was, however, neglected; but after the truth was confirmed by the event, Camillus acknowledged this voice to be a new deity, and erected an altar to it under the name of the *Aius Locutius*.

AJUTAGE, or ADJUTAGE, a kind of tube fitted to the mouth of the vessel through which the water of a fountain is to be played. To the different form and structure of ajutages is owing to the great variety of fountains. See FOUNTAIN and HYDROSTATICS.

AIX, a small but ancient town in the duchy of Savoy, with the title of a marquisate. It is seated on the lake Bourget, at the foot of a mountain, between Chambery, Annecy, and Rumilly. There is here a triumphal arch of the ancient Romans, but it is almost entirely ruined. The mineral waters bring a great number of strangers to this place. The place was originally called *Aquæ Gratiæ*, from the hot baths built there by the emperor Gratian. E. Long. 7. 10. N. Lat. 45. 40.

Aix, an ancient city, the capital of Provence, in France. It is an archbishopric; and has a parliament, a court of aids, a chamber of accounts, a seneschal's jurisdiction, a generality, and an university. It has that air of silence and gloom so commonly characteristic of places destitute of commerce or industry. It is, however, a well-built city; and most like Paris of any place in the kingdom, as well for the largeness of the buildings, as in respect of the politeness of the inhabitants. It is embellished with abundance of fine fountains, and several beautiful squares. The preachers square is on the side of a hill; it is about 160 yards in length, and is surrounded with trees, and houses built with stone three stories high. The town-hall is at one end of the city, and is distributed into several fine apartments: the two lowest are taken up by the board of accounts, and by the seneschal; that above is designed for the sessions of parliament. The hall of audience is adorned with the pictures of the kings of France on horseback. The hotel of the city is a handsome building, but hid by the houses of the narrow street in which it is placed. The cathedral church is a Gothic structure, with tombs of several earls of Provence, and some good pictures by French masters. The Corse, or Orbitelle, is a magnificent walk, above 300 yards long, formed by a triple avenue of elms, and two rows of regular and stately houses. The church of the fathers of the oratory is a handsome building; and not far from thence is the chapel of the blue penitents, which is full of paintings. The convent of preachers is very fine; in their church is a silver statue of the Virgin Mary almost as big as the life. There are other churches and buildings

Aix. buildings which contain a great number of rarities. The baths without the city, which were discovered not long since, have good buildings, raised at a vast expence, for the accommodation of those who drink the waters. Although Aix was the first Roman settlement in Gaul, it is not remarkable for ancient remains. The warm springs from which it is now known and frequented induced Sextus Calvinus to found a colony here, to which he gave the name of *Aquæ Sextiæ*. They were supposed to possess particular virtues in cases of debility; and several altars have been dug up sacred to Priapus, the inscriptions on which indicate their gratitude to that deity for his supposed succour and assistance. E. Long. 5. 32. N. Lat. 43. 32.

Aix, a small island on the coast of France, between the isle of Oleron and the continent. It is twelve miles north-west of Rochfort, and twelve south-south-west of Rochelle. W. Long. 1. 4. N. Lat. 46. 5.

AIX LA CHAPELLE, a fine city of Germany, in the circle of Westphalia and duchy of Juliers.

All authors are agreed about its antiquity, it being mentioned in Cæsar's Commentaries and the Annals of Tacitus. The Romans had colonies and fortresses there, when they were at war with the Germans; but the mineral waters and the hot bath so increased its fame, that, in process of time, it was advanced to the privileges of a city, by the name of *Aquægrani*, that is, the waters of Granius; that which it has now, of *Aix la Chapelle*, was given it by the French, to distinguish it from the other Aix. It is so called, on account of a chapel built in honour of the Holy Virgin by Charlemagne; who having repaired, beautified, and enlarged the city, which was destroyed by the Huns in the reign of Attila in 451, made it the usual place of his residence. The town is seated in a valley surrounded with mountains and woods, and yet the air is very wholesome. It may be divided into the inward and outward city. The inward is encompassed with a wall about three quarters of a league in circumference, having ten gates; and the outward wall, in which there are eleven gates, is about a league and a half in circumference. There are rivulets which run through the town and keep it very clean, turning several mills; besides twenty public fountains, and many private ones. They have stone-quarries in the neighbourhood, which furnish the inhabitants with proper materials for their magnificent buildings, of which the stadt-house and the cathedral are the chief. There are likewise thirty parochial or collegiate churches. The market-place is very spacious, and the houses round it are stately. In the middle, before the stadt-house, is a fountain of blue stones, which throws out water, from six pipes, into a marble basin placed beneath, thirty feet in circumference. On the top of this fountain, is placed the statue of Charlemagne, of brass, gilt, holding a sceptre in his right hand, and a globe in his left. The stadt-house is adorned with the statues of all the emperors since Charlemagne. This fabric has three stories, the upper of which is one entire room of 162 feet in length and 60 in breadth. In this the new-elected emperor formerly entertained all the electors of the empire.

Aix la Chapelle is a free imperial city, and changes its magistracy every year on the eve of St John Baptist. The mayor is in the nomination of the

elector palatine, in the quality of the Duke of Juliers, as protector of the city. This place is famous for several councils and treaties of peace concluded here; particularly those between France and Spain in 1668, and between Great Britain and France in 1748.

The hot sulphureous waters for which this place has so long been celebrated, arise from several sources, which supply eight baths constructed in different parts of the town. These waters near the sources are clear and pellucid; and have a strong sulphureous smell resembling the washings of a foul gun; but they lose this smell by exposure to air. Their taste is saline, bitter, and urinous. They do not contain iron. They are also neutral near the fountain, but afterwards are manifestly and pretty strongly alkaline, insomuch that clothes are washed with them without soap.—On the vaults above the springs and aqueducts of these waters is found, every year, when they are opened, a quantity of fine white-coloured flowers of sulphur, which has been sublimed from the waters.

The heat of the water of the hottest spring, by Dr Lucas's account, raises the quicksilver of Fahrenheit's thermometer to 136—by Mons. Monet's account, to 146—and the heat of the fountain, where they commonly drink, by Dr Lucas's account, to 112.

Dr Simmons has given the following account of their several temperatures, as repeatedly observed by himself with a thermometer constructed by Nairne.

The spring which supplies the Emperor's Bath (<i>Bain de l'Empereur</i>), the New Bath (<i>Bain Neuf</i>), and the Queen of Hungary's Bath (<i>Bain de la Reine Hongrie</i>),	127°
St Quirin's Bath (<i>Bain de St Quirin</i>),	112°
The Rose Bath (<i>Bain de la Rose</i>), and the Poor's Bath (<i>Bain des Pauvres</i>), both which are supplied by the same spring.	112°
Charles's Bath (<i>Bain de Charles</i>), and St Corneille's Bath (<i>Bain de St Corneilles</i>),	112°
The spring used for drinking is in the High Street, opposite to Charles's Bath; the heat of it at the pump is	106°

Dr Lucas evaporated the water of the hottest spring (of the Emperor's Bath), and obtained 268 grains of solid matter from a gallon, composed of 15 grains of calcareous earth, 10 grains of selenites, and 243 grains of a saline matter made up of natron and sea salt. They are at first nauseous and harsh, but by habit become familiar and agreeable. At first drinking, also, they generally affect the head. Their general operation is by stool and urine, without griping or diminution of strength; and they also promote perspiration.

The quantity to be drank as an alterative is to be varied according to the constitution and other circumstances of the patient. In general, it is best to begin with a quarter or half a pint in the morning, and increase the dose afterwards to pints, as may be found convenient. The water is best drank at the fountain. When it is required to purge, it should be drank in large and often-repeated draughts.

In regard to bathing, this also must be determined by the age, sex, strength, &c. of the patient, and by the season. The degree of heat of the bath should likewise be considered. The tepid ones are in general the best, though there are some cases in which the hotter ones are most proper. But even in these, it is best to begin

Aizoon, begin with the temperate baths, and increase the heat gradually.

Akenfide.

These waters are efficacious in diseases proceeding from indigestion and from foulness of the stomach and bowels. In rheumatisms; in the scurvy, scrophula, and diseases of the skin; in hysteric and hypochondriacal disorders; in nervous complaints and melancholy; in the stone and gravel; in paralytic complaints; in those evils which follow an injudicious use of mercury; and in many other cases. They ought not, however, to be given in hectic cases where there is heat and fever, in putrid disorders, or where the blood is dissolved, or the constitution much broken down.

The time of drinking, in the first season, is from the beginning of May to the middle of June; and, in the latter season, from the middle of August to the latter end of September.

There are galleries or piazzas under which the company walk during the time of drinking, in order to promote the operation of the waters.—The Poor's Bath is free for every body, and is frequented by crowds of poor people.

It is scarcely necessary to add, that there are all kinds of amusements common to other places of public resort; but the sharpers appear more splendid here than elsewhere, assuming titles, with an equipage suitable to them.—Aix la Chapelle is 21 miles from Spa, 36 from Liege, and 30 from Cologne. E. Long. 5. 48. N. Lat. 51. 55.

AIZOON, called by Mr Miller *sempervivæ*; though the name Aizoon has been by some writers applied to the house-leek, and also to the aloes: A genus of the pentagynia order, belonging to the icosandria class of plants; and in the natural method ranking under the 13th order, *Succulentæ*. The characters are: The *calyx* is a single-leaved perianthium, divided into five segments, and persistent: There is no *corolla*: The *stamina* consist of very numerous capillary filaments; the antheræ are simple: The *pistillum* has a five-cornered germen above, with five simple styli; and the stigmata are simple: The *pericarpium* is a bellied, retuse, five-cornered capsule, having five cells and five valves: The *seeds* are many and globular.—Linnaeus mentions three species; the canariense, hispanicum, and paniculatum. The first is a native of the Canary islands, the second of Spain, and the third of the Cape of Good Hope. They may all be raised in this country on hot-beds; but as they are not remarkable either for beauty or any other property, it appears unnecessary to take further notice of them.

AKENSIDE (Mark), a physician, who published in Latin "A Treatise upon the Dysentery," in 1764, and a few pieces in the first volume of the "Medical Transactions" of the college of physicians, printed in 1768; but far better known, and to be distinguished chiefly hereafter, as a poet. He was born at Newcastle-upon-Tyne, November 9. 1721; and after being educated at the grammar-school in Newcastle, was sent to the universities of Edinburgh and Leyden; at which last he took his degree of Doctor in Physic. He was afterwards admitted by mandamus to the same degree at Cambridge; elected a fellow of the college of physicians, and one of the physicians at St Thomas's Hospital; and, upon the establishment of the queen's household, appointed one of the physicians to her majesty.

Nº 9.

That Dr Akenfide was able to acquire no other kind of celebrity than that of a scholar and a poet, is to be accounted for by the following particulars in his life and conduct, related by Sir John Hawkins.—Mr Dyson and he were fellow-students, the one of law and the other of physic, at Leyden; where, being of congenial tempers, a friendship commenced between them that lasted through their lives. They left the university at the same time, and both settled in London: Mr Dyson took to the bar, and being possessed of a handsome fortune, supported his friend while he was endeavouring to make himself known as a physician; but in a short time, having purchased of Mr Hardinge his place of clerk of the house of commons, he quitted Westminster-hall; and for the purpose of introducing Akenfide to acquaintance in an opulent neighbourhood near the town, bought a house at North-End, Hampstead; where they dwelt together during the summer-season, frequenting the long-room, and all clubs and assemblies of the inhabitants.

At these meetings, which, as they were not select, must be supposed to have consisted of such persons as usually meet for the purpose of gossiping, men of wealth, but of ordinary endowments, and able to talk of little else than news, and the occurrences of the day. Akenfide was for displaying those talents which had acquired him the reputation he enjoyed in other companies: but here they were of little use to him; on the contrary, they tended to engage him in disputes that betrayed him into a contempt of those that differed in opinion from him. It was found out that he was a man of low birth, and a dependent on Mr Dyson; circumstances that furnished those whom he offended with a ground of reproach, that reduced him to the necessity of asserting in terms that he was a gentleman.

Little could be done at Hampstead after matters had proceeded to this extremity: Mr Dyson parted with his villa at North-End, and settled his friend in a small house in Bloomsbury-square; assigning for his support such a part of his income as enabled him to keep a chariot.—In this new situation Akenfide used every endeavour to become popular, but defeated them all, by the high opinion he every where manifested of himself, and the little condescension he showed to men of inferior endowments; by his love of political controversy, his authoritative censure of the public councils, and his bigotted notions respecting government; subjects foreign to his profession, and with which some of the wisest of it have thought it prudent not to concern themselves. In the winter evenings he frequented Tom's coffee house in Devereux-court, then the resort of some of the most eminent men for learning and ingenuity of the time; with some of whom he became intangled in disputes and altercations, chiefly on subjects of literature and politics, that fixed on his character the stamp of haughtiness and self-conceit, and drew him into disagreeable situations. Hence many, who admired him for his genius and parts, were shy of becoming his intimates.

The value of that precept which exhorts us to live peaceably with all men, or, in other words, to avoid creating enemies, can only be estimated by the reflection on those many amiable qualities against which the neglect of it will preponderate. Akenfide was a man of religion and strict virtue; a philosopher, a scholar, and

Akenside and a fine poet. His conversation was of the most delightful kind; learned, instructive, and, without any affectation of wit, cheerful and entertaining.

Akond.

Dr Akenside died of a putrid fever, June 23. 1770; and is buried in the parish-church of St James's, Westminster.

His poems, published soon after his death in 4to and 8vo, consist of "The Pleasures of Imagination," two books of "Odes," a "Hymn to the Naiads," and some "Inscriptions." "The Pleasures of Imagination," his capital work, was first published in 1744; and a very extraordinary production it was from a man who had not reached his 23d year. He was afterwards sensible, however, that it wanted revision and correction; and he went on revising and correcting it for several years: but finding this task to grow upon his hands, and despairing of ever executing it to his own satisfaction, he abandoned the purpose of correcting, and resolved to write the poem over anew upon a somewhat different and enlarged plan. He finished two books of his new poem, a few copies of which were printed for the use of the author and certain friends; of the first book in 1757, of the second in 1765. He finished also a good part of a third book, and an introduction to a fourth; but his most munificent and excellent friend, conceiving all that is executed of the new work, too inconsiderable to supply the place, and supersede the republication of the original poem, and yet too valuable to be withheld from the public, hath caused them both to be inserted in the collection of his poems.

AKIBA, a famous rabbin, flourished a little after the destruction of Jerusalem by Titus. He kept the flocks of a rich citizen of Jerusalem till the 40th year of his age, and then applied himself to study in the academies for 24 years; and was afterwards one of the greatest masters in Israel, he having 24,000 scholars. He declared for the impostor Barcochebas, whom he owned for the Messiah; and not only anointed him king, but took upon himself the office of his master of the horse. The troops which the emperor Hadrian sent against the Jews, who under the conduct of this false Messiah had committed horrid massacres, exterminated this faction. Akiba was taken, and put to death with great cruelty. He lived 120 years; and was buried with his wife in a cave upon a mountain not far from Tiberias, and his 24,000 scholars were buried round about him upon the same mountain. It is imagined he invented a supposititious work under the name of the patriarch Abraham.

AKISSAT, the ancient Thyatira, a city in Natio-
lia, in Asia, situated in a plain 18 miles broad, which produces plenty of cotton and grain. The inhabitants, who are reckoned to be about 5000, are said to be all Mahometans. The houses are built of nothing but earth or turf dried in the sun, and are very low and ill contrived: but there are six or seven mosques, which are all of marble. There are remarkable inscriptions on marble in several parts of the town, which are part of the ruins of ancient Thyatira. It is seated on the river Hermus, 50 miles from Pergamos. E. Long. 28. 30. N. Lat. 38. 50.

AKOND, an officer of justice in Persia, who takes cognizance of the causes of orphans and widows; of contracts, and other civil concerns. He is the head of

VOL. I. Part I.

the school of law, and gives lectures to all the subaltern officers; he has his deputies in all the courts of the kingdom, who, with the second *sudra*, make all contracts.

AL, an Arabic particle prefixed to words, and signifying much the same with the English particle *the*. Thus they say, alkermes, alkoran, &c. i. e. the kermes, the koran, &c.

AL, or **ALD**, a Saxon term frequently prefixed to the names of places, denoting their antiquity; as Aldborough, Aldgate, &c.

ALA, a Latin term properly signifying a wing; from a resemblance to which several other things are called by the same name: Thus,

ALA, is a term used by botanists for the hollow of a stalk, which either the leaf, or the pedicle of the leaf, makes with it; or it is that hollow turning, or sinus, placed between the stalk or branch of a plant and the leaf, whence a new offspring usually issues. Sometimes it is used for those parts of leaves otherwise called *lobes*, or *wings*.

ALÆ (the plural number) is used to signify those petals or leaves of papilionaceous flowers, placed between those others which are called the *vexillum* and *carina*, and which make the top and bottom of the flowers. Instances of flowers of this structure are seen in those of peas and beans, in which the top leaf or petal is the vexillum, the bottom the carina, and the side ones the alæ.

ALÆ is also used for those extremely slender and membranaceous parts of some seeds, which appear as wings placed on them; it likewise signifies those membranaceous expansions running along the stems of some plants, which are therefore called *alated stalks*.

ALÆ, in anatomy, a term applied to the lobes of the liver, the cartilages of the nostril, &c.

ALÆ, in the Roman art of war, were the two wings or extreme parts of the army drawn up in order of battle.

ALABA, one of the three smallest districts of Biscay in Spain, but pretty fertile in rye, barley, and fruits. There are in it very good mines of iron, and it had formerly the title of a kingdom.

ALABANDA (anc. geog.), a town of Caria, near the Meander, situate beneath eminences resembling asses with pack-saddles, which gave rise to the jest; and between Amyzo to the west and Stratonice to the east. Under the Romans they enjoyed assises, or a convention of jurisdiction, by Pliny reckoned the fourth in order; hence the proverb in Stephanus, expressing their happiness. It was built by Alabandus, whom therefore they deemed a god. The people were called *Alabandi*, *Alabandenses*, Cicero; and *Alabandeis*, after the Greek manner, in coins of Augustus and Claudius; they were also called *Alabandeni* (Livy).

ALABARCHA, in antiquity, a kind of magistrate among the Jews of Alexandria, whom the emperors allowed them to elect, for the superintendency of their policy, and to decide differences and disputes which arose among them.

ALABASTER (William), an English divine, was born at Hadley in the county of Suffolk. He was one of the doctors of Trinity college in Cambridge; and he attended the earl of Essex as his chaplain in the expedition to Cadiz in the reign of queen Elizabeth. It

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Alabaster.

Alabaster. is said, that his first resolutions of changing his religion were occasioned by his seeing the pomp of the churches of the Roman communion, and the respect with which the priests seemed to be treated amongst them; and appearing thus to waver in his mind, he soon found persons who took advantage of this disposition of his, and of the complaints which he made of not being advanced according to his deserts in England, in such a manner, that he did not scruple to go over to the Popish religion, as soon as he found that there was no ground to hope for greater encouragement in his own country. However that matter is, he joined himself to the Romish communion, but was disappointed in his expectations. He was soon displeased at this; he could not reconcile himself to the discipline of that church, which made no consideration of the degrees which he had taken before. It is probable too that he could not approve of the worship of creatures, which Protestants are used to look upon with horror. Upon this he returned to England, in order to resume his former religion. He obtained a prebend in the cathedral of St Paul, and after that the rectory of Therfield in Hertfordshire. He was well skilled in the Hebrew tongue; but he gave a wrong turn to his genius by studying the Cabala, with which he was strangely infatuated. He gave a proof of this in a sermon which he preached upon taking his degree of doctor of divinity at Cambridge. He took for his text the beginning of the first book of Chronicles, Adam, Seth, Enos; and having touched upon the literal sense, he turned immediately to the mystical, asserting, that Adam signified misfortune and misery, and so of the rest. His verses were greatly esteemed. He wrote a Latin tragedy, intitled *Roxana*; which, when it was acted in a college at Cambridge, was attended with a very remarkable accident. There was a lady who was so terrified at the last word of the tragedy, *Sequar, Sequar*, which was pronounced with a very shocking tone, that she lost her senses all her lifetime after. Alabaster was living in 1630. His *Apparatus in Revelationem Jesu Christi* was printed at Antwerp in 1607. As for his *Spiraculum tubarum, seu Fons Spiritualium Expositionum ex equivocis Pentagloti significationibus*, and his *Ecce Sponsus venit, seu tuba pulchritudinis, hoc est demonstratio quod non sit illicitum nec impossibile computare durationem mundi & tempus secundi adventus Christi*, they were printed at London. We may judge from these titles what the taste and genius of the author was.

ALABASTER, in natural history, a species of that genus of stones whose base is calcareous earth. It differs from marble in being combined, not with the aerial, but with vitriolic acid; therefore, when mixed with any acid, no effervescence appears. It is soluble in about 500 times its weight of water at the temperature of 60. It is fusible alone in a long-continued porcelain heat, or by the blow-pipe. Specific gravity 1.87. Texture granular, with shining particles. In composition, and consequently in its chemical properties, it does not differ from gypsum, selenite, and plaster of Paris.

There are three species of alabaster. 1. The snow-white shining alabaster, or lygdinum of the ancients, is found in Taurus, in pieces large enough to make dishes, or the like. It cuts very freely, and is capable of a fine polish. 2. The yellowish alabaster, or phen-

gites of Pliny, is found in Greece; and is of a soft Alabaster. loose open texture, pretty heavy, and nearly of the colour of honey. This species has likewise been found in Germany, France, and in Derbyshire in England. 3. Variegated, yellow, and reddish alabaster. This species is the common alabaster of the ancients, and is so soft that it may be cut with a knife: It is remarkably bright, and almost transparent; admits of a fine polish, and consists of large angular sparry concretions. It is not proof against water; it ferments violently with aquafortis, and burns to a pale yellow. The colour of this species is a clear pale yellow resembling amber, and variegated with undulated veins; some of which are pale red, others whitish, and others of a pale brown. It was formerly brought from Egypt, but is now to be met with in several parts of England. The alabasters are frequently used by statuaries for small statues, vases, and columns. After being calcined and mixed with water, they may be cast in any mould like plaster of Paris. See GYPSUM.

Alabaster, Mr Boyle observes, being finely powdered, and thus set in a basin over the fire, will, when hot, assume the appearance of a fluid, by rolling in waves, yielding to the smallest touch, and emitting vapour; all which properties it loses again on the departure of the heat, and discovers itself a mere incoherent powder. The fineness and clearness of this stone renders it in some measure transparent; whence it has been sometimes also employed for windows. There is a church at Florence still illuminated by alabaster-windows; instead of panes of glass, there are slabs of alabaster near 15 feet high, each of which forms a single window, through which the light is conveyed. The countries in Europe which abound most in alabaster are Germany, toward Coblentz; the province of Maconnois, in the neighbourhood of Cluni in France; Italy, toward Rome; where that of Montaiout is particularly remarkable not only for its whiteness, but also for the bigness of its blocks, some of which are so large, that statues as big as the life may easily be cut out of them. F. Labat, in his journey to Italy, observes, that there are quarries of alabaster in the neighbourhood of the village called de la Toffa, near Civita Vecchia: there is also alabaster to be found in some places of Lorraine; but it is not much esteemed. A new manufacture of basso relievos, from a singular species of factitious alabaster, has been some time ago established by M. Letapie, at the baths of St Philip in Tuscany. The stream at these baths deposits a peculiar kind of sand, which, when collected and condensed in the cavities of any body employed to oppose its current, acquires the nature, hardness, and colour of alabaster, and assumes the forms of those cavities in which it is thus lodged.

ALABASTER, in antiquity, a term used for a vase wherein odoriferous liquors were anciently put. The reason of the denomination is, that vessels for this purpose were frequently made of the alabaster-stone, which Pliny and other ancients represent as peculiarly proper for this purpose. Several critics will have the box mentioned in the Gospels as made of alabaster to have been of glass: And though the texts say that the woman broke it, yet the pieces seem miraculously to have been united, since we are told the entire box was purchased by the emperor Constantine, and preserved as

Alaba-
strum
||
Alamandus.

a relic of great price. Others will have it, that the name *alabaſter* denotes the form rather than the matter of this box: In this view they define alabaſter by a box without a handle, deriving the word from the privative α , and $\lambda\alpha\beta\eta$, *anſa*, handle,

Alabaſter is alſo ſaid to have been uſed for an ancient liquid meaſure, containing ten ounces of wine, or nine of oil. In this ſenſe, the alabaſter was equal to half the ſextary.

ALABAſTRUM DENDROIDE, a kind of laminated alabaſter, beautifully variegated with the figures of ſhrubs, trees, &c. found in great abundance in the province of Hohenſtein.

ALADINISTS, a ſect among the Mahometans, anſwering to free-thinkers among us.

ALADULIA, a conſiderable province of Turkey, in Aſia, in that part called Natolia, between the mountains of Antitaurus, which ſeparate it from Amaſia on the north, and from Carimania on the weſt. It has the Mediterranean ſea on the ſouth; and the Euphrates, or Frat, on the eaſt, which divides it from Diarbeker. It comprehends the Leſſer Armenia of the ancients, and the eaſt part of Cilicia. Formerly it had kings of its own; but the head of the laſt king was cut off by Selim I. emperor of the Turks, who had conquered the country. It is now divided into two parts: the north, comprehended between Taurus, Antitaurus, and the Euphrates, is a beglerbeglic, which bears the name of Marah, the capital town; and the ſouth, ſeated between mount Taurus and the Mediterranean, is united to the beglerbeglic of Aleppo. The country is rough, ragged, and mountainous; yet there are good paſtures, and plenty of horſes and camels. The people are hardy and thieviſh. The capital is Malatigah.

ALAIN (Chartier), ſecretary to Charles VII. king of France, born in the year 1386. He was the author of ſeveral works in proſe and verſe; but his moſt famous performance was his Chronicle of King Charles VII. Bernard de Girard, in his preface to the Hiſtory of France, ſtyles him "an excellent hiſtorian, who has given an account of all the affairs, particulars, ceremonies, ſpeeches, anſwers, and circumſtances, at which he was preſent himſelf, or had information of." Giles Coroxet tells us, that Margaret, daughter to the king of Scotland, and wife to the dauphin, paſſing once through a hall where Alain lay aſleep, ſhe ſtopped and kiſſed him before all the company who attended: ſome of them telling her, that it was ſtrange ſhe ſhould kiſs a man who had ſo few charms in his perſon, ſhe replied, "I did not kiſs the man, but the mouth from whence proceeds ſo many excellent ſayings, ſo many wiſe diſcourſes, and ſo many elegant expreſſions." Mr Fontenelle, among his Dialogues of the Dead, has one upon this incident, between the princeſs Margaret and Plato. Mr Paſquier compares Alain to Seneca, on account of the great number of beautiful ſentences interſperſed throughout his writings.

ALAIS, a conſiderable town of France, in the province of Languedoc, ſituated on the river Gardon, at the foot of the Cevennes. The Jeſuits had a college in this place; and a fort was built here in 1689. It is 34 miles north of Montpellier, and 340 from Paris. E. Long. 4. 20. N. Lat. 44. 8.

ALAMANDUS (Lewis), in French *Aleman*, arch-biſhop of Arles, and cardinal of St Cecilia, was one of

the greateſt men of the fifteenth century. The cardinal preſided in the council of Baſil, which depoſed Eugenius IV. and elected the antipope Felix V. He is much commended by Æneas Sylvius, as a man extremely well formed for preſiding in ſuch aſſemblies, firm and vigorous, illuſtrious by his virtue, learned, and of an admirable memory in recapitulating all that the orators and diſputants had ſaid. One day, when he harangued againſt the ſuperiority of the pope over the council, he diſtinguiſhed himſelf in ſuch an eminent manner, that ſeveral perſons went to kiſs him, while others preſſed even to kiſs his robe. They extolled to the ſkies his abilities and genius, which had raiſed him, though a Frenchman, to a ſuperiority over the Italians, notwithſtanding all their natural ſubtlety and fineſſe. There is no need of aſking, whether Pope Eugenius thundered againſt the preſident of a council which depoſed him. He deprived him of all his dignities, and treated him as a ſon of iniquity. However, notwithſtanding this, Lewis Alamandus died in the odour of ſanctity, and performed ſo many miracles after his death, that at the requeſt of the canons and Celeſtine monks of Avignon, and the ſolicitation of the cardinal of Clermont legate *a latere* of Clement VII. he was beatified by that pope in the year 1527.

ALAMANNI (Lewis) was born at Florence, of a noble family, on the 28th of October 1495. He was obliged to fly his country for a conſpiracy againſt Julius de Medici, who was ſoon after choſen pope under the name of Clement VII. During this voluntary baniſhment, he went into France; where Francis I. from a love to his genius and merit, became his patron. This prince employed him in ſeveral important affairs, and honoured him with the collar of the order of St. Michael. About the year 1540, he was admitted a member of the Inſtammati, an academy newly erected at Padua, chiefly by Daniel Barbaro and Ugolin Martelli. After the death of Francis, Henry duke of Orleans, who ſucceeded him in 1537, ſhewed no leſs favour to Alamanni; and in the year 1551, ſent him as his ambaffador to Genoa: this was his laſt journey to Italy; and being returned to France, he died at Amboiſe on the 18th of April 1556, being in the 61ſt year of his age. He left many beautiful poems, and other valuable performances, in the Italian language. We have alſo ſome notes of his upon Homer's Iliad and Odyſſey; thoſe upon the Iliad were printed in the Cambridge edition of Homer in 1689, and Joſhua Barnes has alſo inſerted them in his fine edition of Homer in 1711.

ALAMODALITY, in a general ſenſe, is the accommodating a perſon's behaviour, dreſs, and actions, to the prevailing taſte of the country or times in which he lives.

ALAMODALITY of writing, is defined the accommodation of mental productions, both as to the choice of ſubject and the manner of treating it, to the genius or taſte of the times, in order to render them more acceptable to the readers.

ALAMODE, a phraſe originally French, importing a thing to be in the faſhion or mode. The phraſe has been adopted not only into ſeveral of the living languages, as the Engliſh and High-Dutch, but ſome have even taken it into the Latin. Hence we meet with *Alamodicus* and *Alamodalitas*.

Alamanni
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Alamode.

Alamode
||
Aland.

ALAMODE, in commerce, a thin glossy black silk, chiefly used for womens hoods and mens mourning scarfs.

ALAMOS (Balthasar), a Spanish writer, born at Medina del Campo in Castile. After having studied the law at Salamanca, he entered into the service of Anthony Perez, secretary of state under Philip II. He was in high esteem and confidence with his master, upon which account he was imprisoned after the disgrace of this minister. He was kept in confinement 11 years, when Philip III. coming to the throne, set him at liberty, according to the orders given by his father in his will. Alamos continued in a private capacity, till the duke of Olivarez, the favourite of Philip IV. called him to public employments. He was a man of wit as well as judgment, but his pen was superior to his tongue. He died in the 88th year of his age. His Spanish translation of Tacitus, and the aphorisms which he added in the margin, gained him great reputation. This work was published at Madrid in 1614; and was to have been followed, as mentioned in the king's privilege, with a commentary, which, however, has never yet appeared. The author composed the whole during his imprisonment.

ALAN (Cardinal William), was born at Rossall in Lancashire, in the year 1532. He went to Oxford at the age of 15, and in 1550 was elected fellow of Oriel college. In 1556, being then only 24 years old, he was chosen principal of St Mary's hall, and one of the proctors of the university. In 1558 he was made canon of York; but, upon queen Elizabeth's accession to the throne, he left England, and settled at Louvain in an English college, of which he became the chief support. In 1565 he visited his native country; but, on account of his extreme activity in the propagation of the Roman Catholic religion, he was obliged to fly the kingdom in 1568. He went first to Mechlin, and then to Doway, where he was made doctor of divinity. Soon after, he was appointed canon of Cambray, and then canon of Rheims. He was created cardinal on the 28th of July 1587, by the title of *St Martin in Montibus*; and obtained from the king of Spain a rich abbey in the kingdom of Naples, and afterwards the bishoprick of Mechlin. It is supposed to have been by the advice and instigation of this priest, that Philip II. attempted to invade England. He died on the 20th of October 1594, aged 63; and was buried in the English college at Rome. He was a man of considerable learning, and an elegant writer. He wrote many books in defence of the Romish religion. The most remarkable are, 1. *A defence of the 12 martyrs in one year*. Tho. Alfield was hanged for bringing, and publishing, this and other of Alan's works, into England, in the year 1584. 2. *A declaration of the sentence of Sextus V. &c.* A work intended to explain the pope's bull for the excommunication of queen Elizabeth, and to exhort the people of England to take up arms in favour of the Spaniards. Many thousand copies of this book, printed at Antwerp, were put on board the Armada; but the enterprise failing, they were afterwards destroyed. 3. *Of the worship due to saints and their relicts* 1583. This treatise was answered by lord Burleigh, and is esteemed the most elegant of the Cardinal's writings.

ALAND, an island of the Baltic sea, between

Sweden and Finland, subject to the former. It lies between 17 and 19 degrees of E. long. and between 59 and 61 degrees of Lat. at the entrance of the gulph of Bothnia.

Alaraf
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Alascani.

ALARAF, in the Mahometan theology, the partition wall that separates heaven from hell. The word is plural, and properly written *al araf*; in the singular it is written *al arf*. It is derived from the Arabic verb *arafa*, to distinguish. Al araf gives the denomination to the seventh chapter of the alcoran, wherein mention is made of this wall. Mahomet seems to have copied his al araf, either from the great gulf of separation mentioned in the New Testament, or from the Jewish writers, who also speak of a thin wall dividing heaven from hell. Mahometan writers differ extremely as to the persons who are to be found on al araf. Some take it for a sort of limbus for the patriarchs, prophets, &c. others place here such whose good and evil works so exactly balance each other, that they deserve neither reward nor punishment. Others imagine this intermediate space to be possessed by those who, going to war without their parents leave, and suffering martyrdom there, are excluded paradise for their disobedience, yet escape hell because they are martyrs.

ALARBES, a name given to those Arabians who live in tents, and distinguish themselves by their dress from the others who live in towns.

ALARES, in Roman antiquity, an epithet given to the cavalry on account of their being placed in the two wings of the army.

ALARIC, a famous general of the Goths. He entered Thrace at the head of 200,000 men, and laid waste all the country through which he passed. He marched next to Macedonia and Thessaly: the Thessalians met him near the mouth of the river Peneas, and killed about 3000 of his army; nevertheless he advanced into Greece, and after having ravaged the whole country, returned to Epirus, loaded with immense spoils: after staying here five years, he resolved to turn his arms to the west. He marched through Pannonia; and, finding little resistance, entered Italy, under the consolfhip of Stilicho and Aurelianus, A. D. 400. After various battles and treaties, he at last took Rome by treachery, and permitted his soldiers to plunder it; this happened A. D. 409. Alaric, having laid waste a great part of Italy, intended to pass into Sicily; but a storm obliging him to land again, he besieged the city of Cosenza; and, having took it, he died there in 411, eleven years after he first entered Italy.

ALARM, in the military art, denotes either the apprehension of being suddenly attacked; or the notice thereof, signified by firing a cannon, firelock, or the like. False alarms are frequently made use of, to harass the enemy, by keeping them constantly under arms. Sometimes also this method is taken to try the vigilance of the piquet-guard, and what might be expected from them in case of real danger.

ALARM-Bell, that rung upon any sudden emergency, as a fire, mutiny, or the like.

ALARM-Post, or ALARM-place, the ground for drawing up each regiment in case of an alarm. This is otherwise called *the rendezvous*.

ALARM, in fencing, is the same with what is otherwise called an appeal, or challenge.

ALASCANI, in church-history, a sect of Antilutherans,

Alasco therans, whose distinguishing tenet, besides their denying baptism, is said to have been this, that the words, *This is my body*, in the institution of the eucharist, are not to be understood of the bread, but of the whole action or celebration of the supper. They are said to have taken the name from one Joannes a Lasco, a Polish baron, superintendant of the church of that country, in England. See the next article.

ALASCO (John), a Polish nobleman of the 16th century, who imbibing the reformed opinions, was expelled his country, and became preacher to a Protestant congregation at Embden; but foreseeing persecution there, came to England about the year 1551, while the reformation was carrying on under Edward the VI. The publication of the Interim driving the Protestants to such places as afforded them toleration, 380 were naturalized here, and obtained a charter of incorporation, by which they were erected into an ecclesiastical establishment, independent on the church of England. The Augustine friars church was granted them, with the revenues, for the maintenance of Alasco as superintendant, with four assistant ministers, who were to be approved by the king: and this congregation lived undisturbed until the accession of Queen Mary, when they were all sent away. They were kindly received and permitted to settle at Embden; and Alasco at last, after an absence of 20 years, by the favour of Sigismund, returned to his own country, where he died in 1560. Alasco was much esteemed by Erasmus, and the historians of his time speak greatly in his praise: we have of his writing, *De Cæna Domini liber; Epistola continens summam Controversiæ de Cæna Domini, &c.* He had some particular tenets; and his followers are called *Alascani* in church history.

ALATAMAHA, a large river of North America, which, rising in the Apalachian mountains, runs south-east through the province of Georgia, and falls into the Atlantic ocean, below the town of Frederica.

ALATERNUS, in botany, the trivial name of a species of the rhamnus. See **RHAMNUS**.

ALAVA, a district of Spain, about 20 miles in length and 17 in breadth, containing very good iron mines. Victoria is the capital town.

ALAUDA, or **LARK**, in ornithology, a genus of birds of the order of passeræ; the characters of which are these: The beak is cylindrical, subulated, straight; and the two mandibles or chaps are of equal size. The tongue is bifid, and the hinder claw is straight, and longer than the toe. There are 28 species of the alauda, of which the following are the most remarkable. 1. The arvensis, or common sky-lark. This and the wood-lark are the only birds that sing as they fly; this raising its note as it soars, and lowering it till it quite dies away as it descends. It will often soar to such a height, that we are charmed with the music when we lose sight of the songster; it also begins its song before the earliest dawn. Milton, in his *Allegro*, most beautifully expresses these circumstances; and bishop Newton observes, that the beautiful scene that Milton exhibits of rural cheerfulness, at the same time gives us a fine picture of the regularity of his life, and the innocency of his own mind: thus he describes himself as in a situation

To hear the lark begin his flight,
And singing startle the dull night,

From his watch-tow'r in the skies,
Till the dappled dawn doth rise.

It continues its harmony several months, beginning early in the spring, on pairing. In the winter they assemble in vast flocks, grow very fat, and are taken in great numbers for our tables. They build their nest on the ground, beneath some clod, forming it of hay, dry fibres, &c. and lay four or five eggs.—The place these birds are taken in the greatest quantity, is the neighbourhood of Dunstable; the season begins about the 14th of September, and ends the 25th of February; and during that space about 4000 dozen are caught, which supply the markets of the metropolis. See *BIRD-CATCHING*. Vastly greater numbers than the above, however, are at times caught in different parts of Germany, where there is an excise upon them. Keyser says, that the excise alone produces 6000 dollars (about L 900 Sterling) every year to the city of Leipzig; whose larks are famous all over Germany as having the most delicate flavour. But it is not only at Leipzig that they are taken in such numbers, but also in the country about Naumburg, Merseburg, Halle, and other parts.—2. The pratensis, or tit-lark, has the two outward feathers of the wing edged with white, and frequents the meadows. It is found frequently in low marshy grounds: like other larks, it builds its nest among the grass, and lays five or six eggs. Like the wood-lark, it sits on trees; and has a most remarkable fine note, singing in all situations, on trees, on the ground, while it is sporting in the air, and particularly in its descent. This bird, with many others, such as the thrush, black-bird, willow-wren, &c. become silent about midsummer, and resume their notes in September: hence the interval is the most mute of the year's three vocal seasons, spring, summer, and autumn. Perhaps the birds are induced to sing again as the autumnal temperament resembles the vernal.—3. The arborea, or wood-lark, is a native of Europe, and is distinguished by an annular white fillet about the head. It is inferior in size to the sky-lark, and is of a shorter thicker form; the colours are paler, and its note is less sonorous and less varied, though not less sweet. It perches on trees, and whistles like the black-bird. It will sing in the night; and, like the common lark, will sing as it flies. It builds on the ground, and makes its nest on the outside with moss, within of dried bents, lined with a few hairs. It lays five eggs, dusky and blotched with deep brown marks, darkest at the thicker end. The males of this and the last are known from the females by their superior size. But this species is not near so numerous as that of the common kind.—4. The campestris has one half of its chief feathers of the wings brown, except two in the middle which are white, and the throat and breast are yellowish.—5. The trivialis, whose chief feathers on the tail are brown, only half of the outermost is white, and the second is white at the end, in the shape of a wedge; there is likewise a double whitish line on the wings. It is a native of Sweden, and perches on the top of trees.—6. The cristata: the chief tail-feathers are black, but the two outermost are edged with white, and the head is crested. It is a native of Europe. It sings well, like the sky-lark; lays four or five eggs; and is said to hatch twice in a year.—7. The spinoletta: the chief tail-feathers are black, only

Alauda
||
Alay.

only the outermost two are obliquely half white. It is a native of Italy.—8. The alpestris: the chief wing-feathers are half white, the throat yellow, and it has a black streak under the eyes and on the breast. It inhabits North America, where it is migratory. It visits the neighbourhood of Albany the beginning of May, but goes farther north to breed. In winter it comes in vast flocks into Virginia and Carolina, returning north in spring. It feeds during its stay in the more southern parts on oats and other grain; and while at Albany, on the grass and the buds of sprig-birch. It runs into holes; whence the natives of these last parts have given it the name of *chi-chup-pi-sue*. The English call it the *ortalon*, and reckon it delicious eating. By some it is called *snow bird*, as being very plenty in that season. It is frequently caught in great numbers by means of horse-hair springes placed in some bare place, the snow being scraped away, and a little chaff strewed about. It is always seen on the ground, and has little or no song. This bird is not peculiar to North America; we hear of it in Germany also; and is in plenty throughout Russia and Siberia, going northward in spring.—9. The magna, is yellow on the belly, with a crooked black streak on the breast, and the three side-feathers of the tail white. It is a native of Africa and America.—10. The New Zealand lark (Plate XVI.) is seven and a half inches in length: the bill is half an inch, of a pale ash-colour, with the upper part black: the upper parts of the body are dusky, edged with pale ash-colour: the breast and belly are white; the legs reddish ash-colour, and the claws black. It inhabits Charlotte Sound, and is called *kogoo aroûre*.

ALAUTA, a considerable river of Turkey in Europe, which, after watering the north-east part of Transylvania and part of Wallachia, falls into the Danube almost opposite to Nicopolis.

ALAY, signifying in the Turkish language "The Triumph," a ceremony which accompanies the assembling together the forces of that vast empire upon the breaking out of a war. It consists of the most insipid buffoonery, and is attended with acts of the most shocking barbarity. That which took place upon occasion of the late war between the Porte and Russia is described by Baron Tott in his Memoirs as follows.

"It consists in a kind of masquerade, in which each trade successively presents to the spectators the mechanical exercise of its respective art. The labourer draws his plough, the weaver handles his shuttle, the joiner his plane; and these different characters, seated in cars richly ornamented, commence the procession, and precede the standard of Mahomet, when it is brought out of the seraglio to be carried to the army, in order to insure victory to the Ottoman troops.

"This banner of the Turks, which they name *Sandjak-Cheriff*, or The standard of the Prophet, is so revered among them, that, notwithstanding its reputation has been so often tarnished, it still retains their implicit confidence, and is the sacred signal unto which they rally. Every thing proclaims its sanctity. None but the emirs are allowed to touch it; they are its guards, and it is carried by their chief. The Mussulmen alone are permitted to look upon it. If touched by other hands, it would be defiled; if seen by

other eyes, profaned. In short, it is encompassed by the most barbarous fanaticism.

"A long peace had unfortunately caused the ridiculousness, and especially the danger, of this ceremony to be forgotten. The Christians imprudently crowded to see it; and the Turks, who, by the situation of their houses, could make money of their windows, began to profit by the advantage; when an emir, who preceded the banner, proclaimed with a loud voice, 'Let no infidel dare to profane with his presence the holy standard of the prophet; and let every Mussulman who perceives an unbeliever make it known under pain of reprobation.'

"From that moment no asylum was to be found; even those became informers, who, by letting out their houses, had rendered themselves accomplices in the crime. A religious fury seized on every mind, and put arms in every hand; the more atrocious the cruelty, the more was it meritorious. No regard was paid to sex or age; pregnant women, dragged by the hair, and trodden under feet by the multitude, perished in the most deplorable manner. Nothing was respected by these monsters; and under such auspices the Turks commenced the war."

ALB, or ALBE, in the Romish church, a vestment of white linen hanging down to the feet, and answering to the surplice of the English clergy. In the ancient church, it was usual, with those newly baptized, to wear an alb, or white vestment; and hence the Sunday after Easter was called *dominica in albis*, on account of the albs worn by those baptized on easter-day.

ALB is also a name of a Turkish coin, otherwise called *asper*. See ASPER.

ALBA (anc. geog.), a town of the Marsi in Italy, situated on the north-side of the Lacus Fucinus, still retaining its name. It stands upon an eminence, and is noted in Roman history for being the state prison where captive princes were shut up, after being barbarously dragged through the streets of Rome at the chariot wheels of a triumphant consul. Perseus king of Macedon terminated his wretched career in this confinement, with his son, the last hope of an illustrious line of kings. Syphax the Numidian, and Bituitus king of the Averni, were also condemned to this gaol by the particular clemency of the senate, which sometimes indulged its savage disposition by putting its captives to death.

Alba being situated in the centre of Italy, amidst difficult mountainous passes, and far from all means of escape, was esteemed a most proper place for the purpose of guarding prisoners of importance. Artificial strength was added to its natural security by fortifications, which remain to this day in a state that proves their ancient solidity. For the entertainment of the garrison, which was required in a place of such consequence, an amphitheatre was erected, of which the ruins are still valuable, as well as the foundations of a temple, and other buildings of Roman times.

Lucius Vitellius, brother to the emperor of that name, had a villa near this place, famous for the variety and excellence of its fruit-trees, which he had brought from Syria. His gardens were the nurseries where several of the most delicious stone-fruits, that are now so common in Europe, were first cultivated and multiplied.

Alb,
Alba.

Alba
||
Alban.

It must have been necessary at Alba to shelter trees transplanted from Asia, and to treat them with great tenderness and care, in order to rear them to perfection: for the climate of this high region is extremely rigorous in winter; the cold season lasts long, and is accompanied with violent storms of wind and falls of snow. The lake has been often frozen entirely over.

ALBA Firma, or *Album*, in our old customs, denoted rent paid in silver, and not in corn, which was called *black-mail*.

ALBA Terra, one of the numerous names for the philosopher's stone.

ALBA Regalis. See STUL WEISSENBURG.

ALBA Helviorum, or *Albaugusta*, (anc. geog.), afterwards called *Vivarium*, now *Viviers*, in the south-east of Languedoc, on the Rhone. In the lower age the inhabitants were called *Albanenses*, and their city *Civitas Albanensium*, in the Notitia Galliarum. E. Long. 4. 45. Lat. 44. 50.

ALBA Julia (anc. geog.), now *Weissenburg*, a town of Transylvania, on the river Marisus, or Merisch, to the west of Hermanstadt, supposed to be called *Alba Julia*, after Julia Domna the mother of Caracalla. There are, however, several inscriptions found at or near Weissenburg, which bear COL. APUL. that is *Colonia Apulensis*, without the least mention of *Alba Julia*, though inscribed after Caracalla's time. Add, that Ulpian, reciting the colonies of Dacia, calls this colony *Apulensis*, and neither *Alba* nor *Julia*. Whence there is a suspicion, that *Alba Julia* is a corruption of *Apulum*. It was also called *Apulum Augustum*. E. Long. 25. 0. Lat. 46. 46.

ALBA Longa (anc. geog.), a colony from Lavinium, in Latium, established by Ascanius the son of Æneas, at the foot of the Mons Albanus: called *Alba*, from a white sow found by Æneas, which farrowed 30 white pigs on that spot; which circumstance was interpreted to portend the building of a city there in 30 years after (Propertius). The epithet *Longa* was added on account of its length. It was the royal residence till the building of Rome, as was foretold by Anchises (Virgil); was destroyed by Tullius Hostilius, all but the fane or temple; and the inhabitants were transplanted to Rome, (Strabo).

ALBA Pompeia (anc. geog.), on the river Ceva, now *Ceva*, in Liguria, the birth-place of the emperor Pertinax; a colony either established at first by Pompey, or re-established by him after having been before settled by Scipio. The inhabitants were called *Albanenses Pompeiani*. At this day the town is simply called *Alba*, without any epithet.

ALBAHURIM, *figura sexdecim laterum*, a figure of great importance according to astrological physicians, who built their prognostics on it.

ALBAN (St) is said to have been the first person who suffered martyrdom for Christianity in Britain; he is therefore usually styled the protomartyr of this island. He was born at Verulam, and flourished towards the end of the third century. In his youth he took a journey to Rome, in company with Amphibalus a monk of Caerleon, and served seven years as a soldier under the emperor Dioclesian. At his return home he settled in Verulam; and, through the example and instructions of Amphibalus, renounced the errors of paganism, in which he had been educated, and

became a convert to the Christian religion. It is generally agreed, that Alban suffered martyrdom during the great persecution under the reign of Dioclesian; but authors differ as to the year when it happened: Bede and others fix it in 286; some refer it to the year 296; but Usserius reckons it amongst the events of 303. The story and circumstances relating to his martyrdom, according to Bede, are as follows. Being yet a pagan (or at least it not being known that he was a Christian), he entertained Amphibalus in his house. The Roman governor being informed thereof, sent a party of soldiers to apprehend Amphibalus; but Alban, putting on the habit of his guest, presented himself in his stead, and was carried before that magistrate. The governor having asked him of what family he was? Alban replied, "To what purpose do you inquire of my family? if you would know my religion, I am a Christian." Then being asked his name, he answered, "My name is Alban; and I worship the only true and living God, who created all things." The magistrate replied, "If you would enjoy the happiness of eternal life, delay not to sacrifice to the great gods." Alban answered, "The sacrifices you offer are made to devils; neither can they help the needy, or grant the petitions of their votaries." His behaviour so enraged the governor, that he ordered him immediately to be beheaded. In his way to execution, he was stopped by a river, over which was a bridge so thronged with spectators that it was impossible to cross it; the saint, as we are told, lifted up his eyes to heaven, and the stream was miraculously divided, and afforded a passage for himself and a thousand more persons. Bede does not indeed give us the name of this river; but, notwithstanding this omission, the miracle, we suppose, will not be the less believed. This wonderful event converted the executioner upon the spot, who threw away his drawn sword, and, falling at St Alban's feet, desired he might have the honour to die with him. This sudden conversion of the headsman occasioning a delay in the execution till another person could be got to perform the office, St Alban walked up to a neighbouring hill, where he prayed for water to quench his thirst, and a fountain of water sprung up under his feet: here he was beheaded, on the 23d of June. The executioner is said to have been a signal example of divine vengeance; for as soon as he gave the fatal stroke, his eyes dropt out of his head. We may see the opinion of Mr Milton in regard to this narrative, in his History of England. His words are these, speaking of St Alban, "The story of whose martyrdom, soiled and worse martyred with the fabling zeal of some idle fancies, more fond of miracles than apprehensive of the truth, deserves no longer digression." Between 4 or 500 years after St Alban's death, Offa, king of the Mercians, built a very large and stately monastery to his memory; and the town of St Alban's in Hertfordshire takes its name from our protomartyr.

ALBANA (anc. geog.), a sea-port town of Albania, on the Caspian sea, between the rivers Casius and Albanus; now called *Bachu*, or *Bachy*, giving name to the Caspian sea, viz. *Mar de Bachu*. E. Long. 49. 0. Lat. 40. 0.

ALBANENSES, in church-history, the same with *Albanenses*, according to some; according to others, different. Those, however, who are for distinguishing them,

Alban
||
Albanenses.

Albani them, attribute the same opinions to both; only making the Albanenses to have been prior in respect of time, as having been found towards the close of the eighth century; whereas the Albigenfes appeared not till the twelfth. See ALBIGENSES.

ALBANI, in Roman antiquity, a college of the *salii*, or priests of Mars; so called from mount Albanus, the place of their residence. See SALII.

ALBANI (Francis), a celebrated painter, born in Bologna, March 17, 1578. His father was a silk merchant, and intended to bring up his son to that business; but Albani having a strong inclination to painting, when his father died, devoted himself entirely to that art, though then but twelve years of age. He first studied under Denys Calvert; Guido Rheni being at the same time under this master, with whom Albani contracted a very great friendship. Calvert drew but one profile for Albani, and afterwards left him entirely to the care of Guido; under whom he made great improvement, his fellow-disciple instructing him with the utmost humanity and good humour. He followed Guido to the school of the Caraches: but a little after their friendship for each other began to cool; which was owing perhaps to the pride of Albani, who could not bear to see Guido surpass him, or to the jealousy of Guido at finding Albani make so swift a progress. They certainly endeavoured to eclipse one another; for when Guido had set up a beautiful altar-piece, Albani would oppose to it some fine picture of his: thus did they behave for some time, and yet spake of each other with the highest esteem. Albani, after having greatly improved himself under the Caraches, went to Rome, where he continued many years, and married in that city; but his wife dying in childbed, at the earnest request of his relations he returned to Bologna, where he entered again into the state of matrimony. His second wife (Doralice) was well descended, but had very little fortune; which he perfectly disregarded, so strongly was he captivated with her beauty and good sense. Albani, besides the satisfaction of possessing an accomplished wife, reaped likewise the advantage of having a most beautiful model; so that he had now no occasion to make use of any other woman to paint a Venus, the Graces, Nymphs, and other deities, whom he took a particular delight in representing. His wife answered this purpose admirably well; for besides her bloom of youth, and the beauty of her person, he discovered in her so much modesty, so many graces and perfections, so well adapted to painting, that it was impossible for him to meet with a more finished woman. She afterwards brought him several boys, all extremely beautiful and finely proportioned; so that she and her children were the originals of his most agreeable and graceful compositions. Doralice was so conformable to his intentions, that she took a pleasure in setting the children in different attitudes, holding them naked, and sometimes suspended by strings, when Albani would draw them in a thousand different ways. It was from them, too, that the famous sculptors Flamand and Argaldi modelled their little cupids.

Albani was of a happy temper and disposition; his paintings, says Malvasia, breathing nothing but content and joy. Happy in a force of mind that conquered every uneasiness, his poetical pencil carried him

Nº 9.

through the most agreeable gardens to Paphos and Citheria: those delightful scenes brought him over the lofty Parnassus to the delicious abodes of Apollo and the Muses; whence what Du Fresnoy says of the famous Giulio Romano may be justly applied to Albani:

Taught from a child in the bright Muses' grots,
He open'd all the treasures of Parnassus,
And in the lovely poetry of painting
The myst'ries of Apollo has reveal'd.

He died the 4th of October 1660, to the great grief of all his friends and the whole city of Bologna. Malvasia has preserved some verses of Francisco de Lemene, intended for his monument; the sense whereof is, "That the mortal remains of the illustrious Albani, he who gave life to shade, lie interred in this tomb; the earth never produced so wonderful an artist, or a hand equal to his immortal one; which gave colours to the soul, and a soul to colours. Prometheus animated clay, and gave life by means of the sun; but Albani animated merely by the assistance of shade." He was very famous in his lifetime, and had been visited by the greatest painters. Several princes honoured him with letters; and amongst the rest king Charles I. who invited him to England by a letter signed with his own hand.

ALBANIA, a province of Turkey in Europe, on the gulph of Venice, bounded by Livadia on the south, by Thessaly and Macedonia on the east, and on the north by Bosnia and Dalmatia. The people are strong, large, courageous, and good horsemen; but are said to be of a thievish disposition: the grand seignior procures excellent soldiers from hence, particularly cavalry, known by the name of *Arnauts*. There are several large towns in this province; and the inhabitants are almost all Christians of the Greek church, and descended from the ancient Scythians. Formerly it was part of the kingdom of Macedonia. Their chief manufacture is carpets. The principal places are Durazzo, Velona, Antivari, Scutari, Croya, Alessio, Dibra, Dolicigno, and Albanapoli. Long. from 28. to 31. E. Lat. from 39. to 43. N.

ALBANIA, a country, of Asia, bounded on the west by Iberia; on the east by the Caspian sea; on the north by mount Caucasus; on the south by Armenia, and the river Cyrus, now Kur; which, springing from the Moschian mountains that separate Colchis from Armenia, and watering the country of Mogan, receives the Aragus and Araxes, and falls into the Caspian sea within a small distance from the southern borders of this country.—The whole country formerly called *Albania*, now goes under the names of *Shirwan* and *East-Georgia*, and is extremely fruitful and pleasant. The ancient historians take notice of the Albanian men being tall, strong-bodied, and, generally speaking, of a very graceful appearance; far excelling all other nations in comeliness as well as stature. Modern travellers take no notice of the appearance of the men; but extol the beauty of the women, which seems to be unnoticed by the ancients. The Albanians were anciently an independent and pretty powerful people; but we find no mention made of their kings till the reign of Alexander the Great, to whom the king of Albania is said to have presented a dog of an extraordinary fierceness and size.—It does not appear that the Albanians

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Albano, St Albans, nians were ever conquered by the Romans, even when their power was at its greatest height; though, when they ventured to engage in war with that powerful empire, they were always defeated, as might naturally be expected.

ALBANO, a town of Italy, on a lake of the same name, in the Campagnio of Rome. It was called by the ancients *Albanum Pompeii*, and built out of the ruins of the ancient Alba Longa, which was destroyed by Tullus Hostilius. It stands within twelve miles south-east of Rome, and for the pleasantness of its situation is the summer retirement of a great many Roman princes. It is likewise the see of a bishop, who is one of the six senior cardinals. The town is famous for its excellent wine, and the ruins of a mausoleum, which, according to the tradition of the inhabitants, was made for Alcanius. The prospect from the garden of the Capuchins is extremely pleasant, taking in the Campania of Rome, and terminating in a full view of the Tuscan sea. Close by the town lies the Alban lake, of an oval figure, and about seven miles in circumference, which, by reason of the high mountains round it, looks like the area of a great amphitheatre. It abounds with excellent fish, and over against the hermitage it is said to be unfathomable. The mountain of Albano is called *Monte Cavo*, on the top of which was a celebrated temple dedicated to Jupiter and Juno. Near the Capuchins there is another convent of Franciscans; and not far from thence the palace of Cardinal Barberini, remarkable for very pleasant gardens, with the ruins of ancient baths, and several old fragments of Mosaic work. E. Long. 13. 10. N. Lat. 41. 43.

There is likewise another town of the same name in the Basilicate of the kingdom of Naples, remarkable for the fertility of the surrounding territory, and for the nobility of the inhabitants.

ALBANS (St), a market-town of Hertfordshire, is a very great thoroughfare, accommodated with good inns, on the north-west road from London, at the distance of 21 miles. This town sends two members to parliament, gives the title of *duke* to the noble family of Beauchamp, and has one of the best markets for wheat in England. St Albans is seated near the ruins of an ancient Roman city, by Tacitus called *Verulam*; and by the Saxons *Watlingcester*, because it is seated on the road called *Watlingstreet*. Nothing now remains of Verulam but the ruins of old walls; in the fields adjacent to which they continue to find Roman coins, as they formerly found tessellated pavements. In memory of St Alban, Offa, king of the Mercians, anno 795, erected an abbey, calling it *St Albans*; and near it the town of the same name was afterwards built. The church of the abbey is remaining to this day: time and the weather have made it look like stone on the outside; but if you break a bit off, the redness of the brick immediately appears. When the monasteries were dissolved, the townsmen paid L.400 to prevent its being levelled with the ground, and have since converted it into a parish-church, which, for its largeness, beauty, and antiquity, claims a particular regard. It had a very noble font of solid brass, in which the children of the kings of Scotland were used to be baptized; and was brought from Edinburgh, by Sir Philip Lea, when the city was in flames; but in the times of the late civil wars, it was taken away. Not

Vol. I. Part I.

many years since, a tomb was discovered in this church, said to be that of Humphry Duke of Gloucester: when the leaden coffin was opened, the body was pretty entire, being preserved in a sort of pickle. There was a stately cross in the middle of the town, as there were in many other places where queen Eleanor's body rested when it was brought out of the north for interment at Westminster; but it has been demolished, as some say, by the inhabitants. The market days are Wednesdays and Saturdays. W. Long. 0. 12. N. Lat. 51. 44.

ALBANUS MONS (anc. geog.), now called *Mont Albano*, 16 miles from Rome, near where Alba Longa stood.

ALBANUS MONS (anc. geog.), to the north of Istria, called *Albius* by Strabo; the extremity of the Alps, which, together with the mountains to the east, joining it, called *Montes Bebi*, separates the farther Liburnia and Dalmatia from Pannonia.

ALBANY, a fortress belonging to the British, seated on the S. W. of Hudson's bay. W. Long. 84. 20. N. Lat. 53. 20.

ALBANY, a town of North America, the capital of one of the ten counties of the province of New-York, which goes by the same name, is a well-built place, considering the country. Here the sachems, or the kings of the Five Nations of Iroquois, met the governors of the British plantations, when they entered into any treaty with them. W. Long. 44. 29. N. Lat. 42. 30.

ALBARAZIN, a strong town, and one of the most ancient of the kingdom of Arragon in Spain. It is seated upon an eminence, near the river Guadaluquivir, a little below its source, and on the frontiers of Valencia and New Castile. It is the seat of a bishop, and produces the best wool in all Arragon. It is about 100 miles east of Madrid. E. Long. 2. 10. N. Lat. 40. 32.

ALBARI, in antiquity, properly denoted those who gave the whitening to earthen vessels, &c. In which sense they stood contradistinguished from *Dealbatores*, who whitened walls.

ALBARIUM OPUS, in the ancient building, the incrustation or covering of the roofs of houses with white plaster, made of mere lime. This is otherwise called *opus album*. It differs from *Tectorium*, which is a common name given to all roofing or ceiling, including even that formed of lime and sand, or lime and marble; whereas *Albarium* was restrained to that made of lime alone.

ALBATI EQUI, an appellation given to such horses, in the games of the ancient circus, as wore white furniture.

ALBATROSS, in ornithology, a species of the diomedea. See DIOMEDEA.

ALBAZIN, a town of Greater Tartary, with a strong castle. It is situated upon the river Amur, or Yamour, and belongs to the Muscovites. E. Long. 103. 30. N. Lat. 54. 0.

ALBE, a small piece of money, current in Germany, worth only a French sol and seven deniers.

ALBEMARLE, or AUMARLE, a town of France, in Upper Normandy, and in the territory of Caux, from whence the noble family of Keppel takes the title of *Earl*. The serges of this town are in high esteem.

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Albanus
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Albemarle.

Albemarle
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Albertus.

It is seated on the declivity of a hill, on the confines of Picardy, 35 miles N. E. of Rouen, and 70 N. W. of Paris. E. Long. 2. 21. N. Lat. 49. 50.

ALBEMARLE, the most northern part of the province of North Carolina in America.

ALBENGUA, a town of Italy, in the territory of Genoa. It is the see of a bishop; and is a very ancient handsome town, but not well peopled on account of the insalubrity of the air. However, it is seated in a very beautiful plain, which is well cultivated; and the outside of the town is surrounded with olive-trees. It is a seaport, about 38 miles S. W. of Genoa. E. Long. 8. 13. N. Lat. 44. 4.

ALBERNUO, a kind of camblet, brought from the Levant by the way of Marseilles.

ALBERONI (Julius), the son of a poor gardener in the suburbs of Placentia, born in 1664; who, by his great abilities and good fortune, rose from this low original, to the employment of first minister of state at the court of Spain, and to the dignity of cardinal. He roused that kingdom out of the lethargy it had sunk into for a century past; awakened the attention, and raised the astonishment, of all Europe, by his projects; one of which was to set the Pretender on the throne of Great Britain. He was at length deprived of his employment, and banished to Rome. He died in 1752, at the great age of 89. His *Testament Politique*, collected from his memoirs and letters, was published at Lausanne in 1753.

ALBERT, Margrave of Brandenburg, and the last grand master of the Teutonic Order, laid aside the habit of his order, embraced Lutheranism, and concluded a peace at Cracow in 1525, by which he was acknowledged Duke of the east part of Prussia (formerly called for that reason *Ducal Prussia*), but to be held as a fief of Poland, and to descend to his male heirs. See PRUSSIA.

ALBERTI (Leone Battista), was descended from a noble family in Florence; and was perfectly acquainted with painting, sculpture, and architecture. He wrote of all three in Latin; but his studies did not permit him to leave any thing considerable behind him in painting. He was employed by pope Nicholas V. in his buildings, which he executed in a beautiful manner; and his work on architecture, which consists of ten books, is greatly esteemed. He also wrote some treatises of morality, and a piece on arithmetic. He died in 1485.

ALBERTISTS, a sect of scholastics, so named from their leader Albertus Magnus.

ALBERTUS (Magnus), a Dominican friar, and afterwards bishop of Ratisbon, was one of the most learned men and most famous doctors of the 13th century. He is said to have acted as a man-midwife; and some have been highly offended that one of his profession should follow such an employment. A book intitled *De Natura Rerum*, of which he was reputed the author, gave rise to this report. In this treatise there are several instructions for midwives, and so much skill shown in their art, that one would think the author could not have arrived at it without having himself practised: but the advocates for Albert say he was not the writer thereof, nor of that other piece *De Secretis Mulierum*; in which there are many phrases and expressions unavoidable on such a subject, which

gave great offence, and raised a clamour against the supposed author. It must be acknowledged, however, that there are, in his Comment upon the Master of Sentences, some questions concerning the practice of conjugal duty, in which he has used some words rather too gross for chaste and delicate ears: but they allege what he himself used to say in his own vindication, that he came to the knowledge of so many monstrous things at confession, that it was impossible to avoid touching upon such questions. Albert was certainly a man of a most curious and inquisitive turn of mind, which gave rise to other accusations brought against him. They say, that he laboured to find out the philosopher's stone; that he was a magician; and that he made a machine in the shape of a man, which was an oracle to him, and explained all the difficulties he proposed. He had great knowledge in the mathematics, and by his skill in that science might probably have formed a head with springs capable of articulate sounds; like to the machines of Boetius, of which Cassiodorus has said, "Metals lowe; the birds of Diomedes trumpet in brass; the brazen serpent hisses; counterfeited swallows chatter, and such as have no proper note, from brass send forth harmonious music." John Matthæus de Luna, in his treatise *De Rerum Inventoribus*, has attributed the invention of fire-arms to Albert; but in this he is confuted by Naude, in his *Apoloogie des Grands Hommes*. We are told, that Albert was naturally very dull, and so incapable of instruction, as to be upon the point of quitting the cloister, from despair of learning what his habit required: but that the Holy Virgin appeared to him, and asked him in which he chose to excel, philosophy, or divinity? that having chosen the former, she assured him he should become incomparable therein; but that, as a punishment for not preferring divinity, he should sink, before he died, into his former stupidity. It is added, that after this apparition he had an infinite deal of wit; and that he advanced in all the sciences with so quick a progress, as utterly astonished his masters: but that three years before his death, he stopped short when reading a divinity-lecture at Cologne; and having in vain endeavoured to recal his ideas, he found that the Virgin's prediction was accomplished. "It would be very unnecessary (says Bayle, after relating these particulars) to observe that they are fables. Those who would believe me need not be told this, since they would judge in the same manner of their own accord; and as for such as think otherwise, they would not alter their opinion by reading here that I am of a different way of thinking." Albert died at Cologne, November 15. 1280. His works were printed at Lyons, in 1651, in 21 volumes in folio.

ALBERTUS, a gold coin, worth about 14 French livres: it was coined during the administration of Albertus archduke of Austria.

ALBESIA, in antiquity, a kind of shields otherwise called *Decumana*. See DECUMANA.

ALBI, a city of France, the capital of the Albigeois, in Languedoc, and the see of an archbishop. The cathedral is dedicated to St Cecilia, and has one of the finest choirs in the kingdom. Here is a very valuable silver shrine, of exquisite workmanship, of the Mosaic kind: it contains the reliques of St Clair, the first bishop of this city. The chapel of this pretended saint

Albertus
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Albi.

Albi, saint is magnificent, and adorned with paintings. The **Albigenses.** Lice is a fine large walk without the city: what distinguishes this from all others, is a terras above a deep mall, which serves instead of a fosse; it is bordered with two rows of very fine trees, which are kept in excellent order. There are four gates, through which you may view all the beauties of a delightful plain. At one end of this is the convent of the Dominicans. The archbishop's palace is very beautiful. The river washes its walls, and serves both for an ornament and defence. This city is seated on the river Tarn, 35 miles north-by-west of Toulouse, and 250 south of Paris. E. Long. o. 52. N. Lat. 43. 56.

The Albigeois is a small territory about 27 miles in length, and 20 in breadth, abounding in corn, woad, grapes, saffron, plums, and sheep; and the inhabitants drive a great trade in dried prunes, grapes, a coarse sort of cloth, and wines of Gaillac. These wines are the only sorts hereabouts that are fit for exportation: they are carried down to Bourdeaux, and generally sold to the British. They have likewise several coal-mines.

ALBIGENSES, in church-history, a sect or party of reformers, about Toulouse and the Albigeois in Languedoc, who sprung up in the 12th century, and distinguished themselves by their opposition to the discipline and ceremonies of the Romish church.

This sect had their name, it is supposed, either by reason there were great numbers of them in the diocese of Albi, or because they were condemned by a council held in that city. In effect, it does not appear that they were known by this name before the holding of that council. The *Albigenses* were also called *Albiani*, *Albigesei*, *Albii*, and *Albanenses*, though some distinguish these last from them. Other names given to them are, *Henricians*, *Abelardists*, *Bulgarians*, &c. some on account of the qualities they assumed; others on that of the country from whence it is pretended they were derived; and others on account of persons of note who adopted their cause, as Peter de Brius, Arnold de Bresse, Abelard, Henry, &c. Berengarius, if not Wickliff himself, is by some ranked in the number. The *Albigenses* are frequently confounded with the *Waldenses*; from whom, however, they differ in many respects, both as being prior to them in point of time, as having their origin in a different country, and as being charged with divers heresies, particularly Manicheism, from which the *Waldenses* are exempt. But several Protestant writers have vindicated them from that imputation. Dr Allix shows, that a great number of *Manichees* did spread over the western countries from Bulgaria; and settled in Italy, Languedoc, and other places, where there were also *Albigenses*; by which means, being both under the imputation of *heresy*, they came, either by ignorance or malice, to be confounded, and called by the same common name, though in reality entirely different.

Other errors imputed to them by their opponents, the monks of those days, were, That they admitted two Christs; one evil, who appeared on earth; the other good, who has not yet appeared: That they denied the resurrection of the body; and maintained human souls to be daemons imprisoned in our bodies, by way of punishment for their sins: That they condemned all the sacraments of the church; rejected baptism as

useless; held the eucharist in abhorrence; excluded the use of confessions and penance; maintained marriage unlawful; laughed at purgatory, prayers for the dead, images, crucifixes, &c.—There were likewise said to be two classes of them; the Perfect, and the Believers. The perfect boasted of their living in continence, of eating neither flesh, eggs, nor cheese. The believers lived like other men, and were even loose in their morals; but they were persuaded they should be saved by the faith of the perfect, and that none were damned who received imposition of hands from them. But from these charges also they are generally acquitted by Protestants; who consider them as the pious inventions of the Romish church, whose members deem it meritorious by any means to blacken heretics.

However this be, the *Albigenses* grew so formidable, that the Catholics agreed upon a holy league or croisade against them. They were at first supported by Raimond, count of Toulouse. Pope Innocent III. desirous to put a stop to their progress, sent a legate into their country; which failing, he stirred up Philip Augustus, king of France, and the other princes and great men of the kingdom, to make war upon them. Upon this the count of Toulouse, who had sided with them, made his submission to the pope, and went over to the Catholics: but soon after, finding himself plundered by the croisaders, he declared war against them, and was joined by the king of Arragon. His army was defeated at the siege of Muret, where he himself was killed, and the defeat followed by the surrender of the city of Toulouse, and the conquest of the greatest part of Languedoc and Provence. His son Raimond succeeded him; who agreed with the king and the pope to set up the inquisition in his estates, and to extirpate the *Albigenses*. In an assembly held at Milan, the archbishop of Toulouse drew up articles; agreeable to which the count made a most ample declaration against them, which he published at Toulouse in 1253. From this time the *Albigenses* dwindled by little and little, till the times of the reformation; when such of them as were left fell in with the Vaudois, and became conformable to the doctrine of Zuinglius and the disciples of Geneva.

ALBIGENSES is also a name sometimes given to the followers of Peter Vaud, or Waldo; and hence synonymous with what we more properly call *Waldenses*, or Poor Men of Lyons. In this sense the word is applied by Camerarius, Thuanus, and several other writers. The reason seems to be, that the two parties agreed in their opposition to the papal innovations and incroachments, though in divers other respects said to be different enough. The bishop of Meaux labours hard to support a distinction between the two sects, alleging that the *Albigenses* were heretics and Manichees; whereas the *Waldenses* were only schismatics, not heretics; being sound as to articles of faith, and only separating from the church of Rome on account of forms and discipline. Dr Allix endeavours to set aside the distinction; and shows, that both of them hold the same opinions, and were equally condemned and held for heretics: and this not for points of faith, but for declaiming against the papal tyranny and idolatry, and holding the pope to be the Antichrist; which last, according to M. de Meaux, constitutes nothing less than

Albinte-
melium
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Albinos.

Manicheism. In this sense the Lollards and Wickliffites in England were not only Albigenes but Manichees.

ALBINTEMELIUM, ALBINTIMILIUM, (Tacitus;) or at full length, ALBIUM INTEMELIUM, (Pliny, Strabo); now *Vintimiglia*, situated in the south-west of the territory of Genoa, near the borders of the county of Nice, with a port on the Mediterranean, at the mouth of the rivulet Rotta, almost about half-way between Monaco and S. Remo. E. Long. 7. 40. Lat. 43. 17.

ALBIOECE, or ALEBECE, (Pliny, Strabo); otherwise called *Reii Apollinares*, from their superstitious worship of Apollo; also *Civitas Reiensium*; now *Riez*, in Provence, about 18 leagues to the north-east of Toulon, on the north side of the rivulet Verdon; was originally a Roman colony, (Inscription.) It is sometimes written *Regium*. The people were called *Albici*, (Cæsar.) E. Long. 1. 0. Lat. 43. 20.

ALBINI, in antiquity, the workmen employed in what was called *Opus Albarium*. They make a different profession from the *dealbatores* or *whiteners*.

ALBINOS, the name by which the Portuguese call the white Moors, who are looked upon by the negroes as monsters. They at a distance might be taken for Europeans; but, when you come near them, their white colour appears like that of persons affected with a leprosy.

In SAUSSURE'S *Voyages dans les Alpes*, is the following account of two boys, at Chamouni, who have been called *Albinos*. "The elder, who was at the end of the year 1785 about twenty, or one-and-twenty years of age, had a dull look, with lips somewhat thick, but nothing else in his features to distinguish him from other people. The other, who is two years younger, is rather a more agreeable figure: he is gay and sprightly, and seems not to want wit. But their eyes are not blue; the iris is of a very distinct rose-colour: the pupil too, when viewed in the light, seems decidedly red; which seems to demonstrate, that the interior membranes are deprived of the uvea, and of that black mucous matter that should line them. Their hair, their eye-brows, and eye-lashes, the down upon their skin, were all, in their infancy, of the most perfect milk-white colour, and very fine; but their hair is now of a reddish cast, and has grown pretty strong. Their sight too is somewhat strengthened; though they exaggerate to strangers their aversion for the light, and half-shut the eye-lids, to give themselves a more extraordinary appearance. But those who, like me, have seen them in their infancy, before they were tutored to this deceit, and when too few people came to Chamouni to make this affectation profitable to them, can attest that then they were not very much offended with the light of day. At that time, they were so little desirous of exciting the curiosity of strangers, that they hid themselves to avoid such; and it was necessary to do a sort of violence to them before they could be prevailed on to allow themselves to be inspected. It is also well known at Chamouni, that when they were of a proper age they were unable to tend the cattle like the other children at the same age; and that one of their uncles maintained them out of charity, at a time of life when others were capable of gaining a subsistence by their labour.

"I am therefore of opinion, that we may consider these two lads as true albinos: for if they have not the thick lips and flat noses of the white negroes, it is because they are albinos of Europe, not of Africa. This infirmity affects the eyes, the complexion, and the colour of the hair; it even diminishes the strength, but does not alter the conformation of the features. Besides, there are certainly in this malady various degrees: some may have less strength, and be less able to endure the light: but these circumstances in those of Chamouni are marked with characters sufficiently strong to intitle them to the unhappy advantage of being classed with that variety of the human species denominated albinos.

"When nature presents the same appearance often, and with circumstances varied, we may at last discover some general law, or some relation which that appearance has with known causes: but when a fact is so singular and so rare, as that of those albinos, it gives but little scope to conjectures: and it is very difficult to verify those by which we attempt to explain it.

"I at first imagined that this disease might be referred to a particular sort of organic debility; that a relaxation of the lymphatic vessels within the eye might suffer the globules of the blood to enter too abundantly into the iris, the uvea, and even into the retina, which might occasion the redness of the iris and of the pupil. The same debility seemed also to account for the intolerance of the light, and for the whiteness of the hair.

"But a learned physiologist, M. Blumenbach, professor in the university at Gottingen, who has made many profound observations on the organs of sight, and has considered with great attention the albinos of Chamouni, attributes their infirmity to a different cause.

"The study of comparative anatomy has furnished him with frequent opportunities of observing this phenomenon; he has found it in brutes, in white dogs, and in owls; he says, it is generally to be seen in the warm-blooded animals; but that he has never met with it in those with cold blood.

"From his observations, he is of opinion, that the redness of the iris, and of the other internal parts of the eye, as well as the extreme sensibility that accompanies this redness, is owing to the total privation of that brown or blackish mucus, that, about the fifth week after conception, covers all the interior parts of the eye in its sound state. He observes, that Simon Pontius, in his treatise *de Coloribus Oculorum*, long ago remarked, that in blue eyes the interior membranes were less abundantly provided with this black mucus, and were therefore more sensible to the action of light. This sensibility of blue eyes agrees very well, says M. Blumenbach, with northern people, during their long twilight; while, on the contrary, the deep black in the eyes of negroes enables them to support the splendor of the sun's beam in the torrid zone.

"As to the connection between this red colour of the eyes and the whiteness of the skin and hair, the same learned physiologist says, that it is owing to a similarity of structure, *consensus ex similitudine fabricæ*. He asserts, that this black mucus is formed only in the delicate cellular substance, which has numerous blood-vessels contiguous to it, but contains no fat; like the inside of the eye, the skin of negroes, the spotted palate of several domestic animals, &c. And, lastly, he

Albinos. says, that the colour of the hair generally corresponds with that of the iris. *Gazette litt. de Göttingue*, Oct. 1784.

"At the very time that M. Blumenbach was reading this memoir to the Royal Society of Göttingen, M. Buzzi, surgeon to the hospital at Milan, an élève of the celebrated anatomist Moscati, published, in the *Opuscoli Scelti de Milan*, 1784, t. vii. p. 11. a very interesting memoir, in which he demonstrates by dissection what Blumenbach had only supposed.

"A peasant of about 30 years of age died at the hospital of Milan of a pulmonary disorder. His body, being exposed to view, was exceedingly remarkable by the uncommon whiteness of the skin, of the hair, of the beard, and of all the other covered parts of the body. M. Buzzi, who had long desired an opportunity of dissecting such a subject, immediately seized upon this. He found the iris of the eyes perfectly white, and the pupil of a rose-colour. The eyes were dissected with the greatest possible care, and were found entirely destitute of that black membrane which anatomists call the *uvea*: it was not to be seen either behind the iris or under the retina. Within the eye there was only found the choroid coat extremely thin, and tinged of a pale red colour, by vessels filled with discoloured blood. What was more extraordinary, the skin, when detached from different parts of the body, seemed also entirely divested of the *rete mucosum*: maceration did not discover the least vestige of this, not even in the wrinkles of the abdomen, where it is most abundant and most visible.

"M. Buzzi likewise accounts for the whiteness of the skin and of the hair, from the absence of the *rete mucosum*, which, according to him, gives the colour to the cuticle, and to the hairs that are scattered over it. Among other proofs of this opinion, he alleges a well-known fact, that if the skin of the blackest horse be accidentally destroyed in any part of the body, the hairs that afterwards grow on that part are always white, because the *rete mucosum* which tinges those hairs is never regenerated with the skin.

"The proximate cause of the whiteness of albinos, and the colour of their eyes, seems therefore pretty evidently to depend on the absence of the *rete mucosum*: But what is the remote cause?

"In the first place, it seems probable that men affected with this infirmity form no distinct species, for they are produced from parents that have dark skins and black eyes. What is it then that destroys the *rete mucosum* in such persons? M. Buzzi relates a singular fact, which seems to throw some light on this subject.

"A woman of Milan, named Calcagni, had seven sons. The two eldest had brown hair and black eyes; the three next had white skins, white hair, and red eyes: the two last resembled the two eldest. It was said that this woman, during the three pregnancies that produced the albinos, had a continual and immoderate appetite for milk, which she took in great quantities: but that when she was with child of the other four children, she had no such desire. It is not however ascertained, that this preternatural appetite was not itself the effect of a certain heat, or internal disease, which destroyed the *rete mucosum* in the children before they were born.

"The albinos of Chamouni are also the offspring of

parents with dark skins and black eyes. They have three sisters by the same father and mother, who are also brunettes. One of them that I saw had the eyes of a dark brown, and the hair almost black. They are said, however, to be all afflicted with a weakness of sight. When the lads are married, it will be curious to observe how the eyes of their children will be formed. The experiment would be particularly decisive if they were married to women like themselves. But this faulty conformation seems to be more rare among women than among men; for the four of Milan, the two of Chamouni, the one described by Mauperitus, the one by Helvetius, and almost all the instances of these singular productions, have been of our sex. It is known, however, that there are races of men and women affected with this disease, and that these races perpetuate themselves in Guinea, in Java, at Panama, &c.

"Upon the whole, this degeneration does not seem to be owing to the air of the mountains; for though I have traversed the greatest part of the Alps, and the other mountains of Europe, these are the only individuals of the kind that ever I met with."

ALBINOVANUS, a Latin poet, whom Ovid sur-named the *Divine*. There is now nothing of his extant, except an Elegy on Drusus, and another on the Death of Mæcenas.

ALBINUS (Bernhard Siegfried), a celebrated physician and anatomist, was born, of an illustrious family, at Francfort on the Oder in 1697. His father was then professor of the practice of medicine in the university of Francfort; but in the year 1702 he repaired to Leyden, being nominated professor of anatomy and surgery in that university. Here his son had an opportunity of studying under the most eminent masters in Europe, who, from the singular abilities which he then displayed, had no difficulty in prognosticating his future eminence. But while he was distinguished in every branch of literature, his attention was particularly turned to anatomy and surgery. His peculiar attachment to these branches of knowledge gained him the intimate friendship of Ruysch and Rau, who at that time flourished in Leyden; and the latter, so justly celebrated as a lithotomist, is said to have seldom performed a capital operation without inviting him to be present. Having finished his studies at Leyden, he went to Paris, where he attended the lectures of DuVerney, Vaillant, and other celebrated professors. But he had scarce spent a year there, when he was invited by the curators of the university of Leyden, to be a lecturer in anatomy and surgery at that place. Though contrary to his own inclination, he complied with their request, and upon that occasion was created Doctor of physic without any examination. Soon after, upon the death of his father, he was appointed to succeed him as professor of anatomy; and upon being admitted into that office on the 9th of November 1721, he delivered an oration, *De vera via ad fabricæ humani corporis cognitionem ducente*; which was heard with universal approbation. In the capacity of a professor, he not only bestowed the greatest attention upon the instruction of the youth entrusted to his care, but in the improvement of the medical art. With this view, he published many important discoveries of his own; and by elegant editions, turned the attention of physicians to works of merit, which might otherwise have been neglected.

Albinovanus,
Albinus.

Albion
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Albourg.

neglected. By these means his fame was soon extended over Europe; and the societies of London, Peterburgh, and Harlem, cheerfully received him as an associate. In 1745, he was appointed professor of the practice of medicine at Leyden, and was succeeded in the anatomical chair by his brother Frid. Bern. Albinus. He was twice rector of the university, and as often he refused that high honour when it was voluntarily offered him. At length, worn out by long service and intense study, he died on the 9th of September 1770, in the 74th year of his age.

ALBION, the ancient name of BRITAIN.

New ALBION, a name given by Sir Francis Drake to California.

ALBIREO, in astronomy, a star of the third or fourth magnitude, in the constellation CYGNUS.

ALBIS (anc. geog.), now the Elbe, which divided ancient Germany in the middle, and was the boundary of the ancient geography of Germany, so far as that country was known to the Romans: all beyond they owned to be uncertain, no Roman except Drusus and Tiberius having penetrated so far as the Elbe. In the year of the building of the city 744, or about six years before Christ, Domitius Ahenobarbus, crossing the river with a few, merited the ornaments of a triumph; so glorious was it reckoned at Rome to have attempted the passage. In the following age, however, the river that before occupied the middle of ancient Germany, became its boundary to the north, from the irruptions of the Sarmatæ, who possessed themselves of the Transalbin Germany. The Elbe rises in the borders of Silesia, out of the Risenberg, runs through Bohemia, Misnia, Upper Saxony, Anhalt, Magdeburg, Brandenburg, Danneberg, Lauenburg, Holstein, and after being swelled by many other rivers, and passing by Hamburg and Gluckstadt, falls into the German, or North Sea, to both which places the river is navigable by large vessels.

ALBISOLA, a small town belonging to the republic of Genoa: here is a porcelain manufacture, and several country-houses of the Genoese nobility. It was bombarded in 1745 by the English. E. Long. 8. 20. N. Lat. 44. 15.

ALBOGALERUS, in Roman antiquity, a white cap worn by the *flamen dialis*, on the top of which was an ornament of olive branches.

ALBORAK, amongst the Mahometan writers, the beast on which Mahomet rode in his journeys to heaven. The Arab commentators give many fables concerning this extraordinary vehicle. It is represented as of an intermediate shape and size between an ass and a mule. A place, it seems, was secured for it in paradise at the intercession of Mahomet; which, however, was in some measure extorted from the prophet, by Alborak's refusing to let him mount him when the angel Gabriel was come to conduct him to heaven.

ALBORO, in zoology, a name by which the erythrinus, a small red fish caught in the Mediterranean, is commonly known in the markets of Rome and Venice.

ALBOURG, a town of Denmark, in North Jutland, capital of the diocese of the same name, and a bishop's see. It has this name, which signifies *eel-town*, on account of the great number of eels taken here. It is seated on a canal, 10 miles from the sea, 30 north of Wiburgh, and 50 north of Arhuys. It has an ex-

change for merchants, and a safe and deep harbour. Albrius
||
Albuga.

They have a considerable trade in herrings and corn; and a manufactory of guns, pistols, saddles, and gloves. E. Long. 29. 16. N. Lat. 56. 35.

ALBRICIUS, born at London, was a great philosopher, a learned and able physician, and well versed in all the branches of polite literature. He lived in the 11th century, and wrote several works in Latin; particularly, 1. Of the Origin of the Gods. 2. The Virtues of the Ancients. 3. The Nature of Poison, &c.

ALBUCA, BASTARD STAR-OF-BETHLEHEM: A genus of the monogynia order, belonging to the hexandria class of plants; and in the natural method ranking under the 10th order, *Coronariae*. The characters are: The *calyx* is wanting: The *corolla* consists of six oval oblong petals, which are persistent: The *stamina* consist of six three-sided filaments the length of the corolla; of these, three are fertile, with versatile antheræ; three are barren, without antheræ: The *pistillum* has an oblong three-sided germen; the stylus is three-sided: The *pericarpium* is an oblong obtuse triangular capsule, having three cells and three valves: The *seeds* are numerous, flat, and incumbent. Of this genus Linnæus reckons only two

Species. 1. The major, or star-flower, with spear-shaped leaves. This is a native of Canada, and some other parts of North America. The root is bulbous; from whence shoot up eight or ten long, narrow, spear-shaped leaves. In the centre of these arises a flower-stem, a foot or more in height, garnished with a loose spike of greenish yellow flowers. After the flowers are past, the germen swells to a three-cornered capsule, having three cells filled with flat seeds. 2. The minor, or African star-flower, is a native of the Cape of Good Hope. This hath also a pretty large bulbous root, from which arise four or five narrow awl-shaped leaves, of a deep green colour; the flower-stem, which comes from the centre of the root, is naked, and rarely rises more than eight or nine inches high, having five or six greenish-yellow flowers, growing almost in the form of an umbel at top: these are rarely succeeded by seeds in Britain.

Culture. The Canada albuca is hardy; so the roots may be planted about four inches deep in a border of light earth, where they will thrive and produce their flowers late in the summer: but as the seeds do not often ripen in Britain, and the bulbs put out few off-sets, the plants are not common in this country. The African sort generally flowers twice a-year; first in March or April, and again in July or August; and if its roots are kept in pots filled with light earth, sheltered under a hot-bed frame, they will flower even in winter; but the best method is to have a border in the front of a green-house, or stove, where the roots of most of the bulbous flowers may be planted in the full ground, and screened in winter from frost: in such situations they thrive much better, and flower stronger, than when kept in pots.

ALBUGINEA TUNICA, in anatomy, the third or innermost coat or covering of the testes; it is likewise the name given to one of the coats of the eye.

ALBUGINEUS, in anatomy, a term sometimes applied to the aqueous humour of the eye.

ALBUGO, or LEUCOMA, in medicine, a distemper occasioned

Album occasioned by a white opaque spot growing on the *cornea* of the eye, and obstructing vision. See **MEDICINE-Index**.

ALBUM, in antiquity, a kind of white table, or register, wherein the names of certain magistrates, public transactions, &c. were entered. Of these there were various sorts; as the *album decurionum*, *album senatorum*, *album judicum*, *album prætoris*, &c.

ALBUM Decurionum, was the register wherein the names of the decuriones were entered. This is otherwise called *matriculatio decurionum*.

ALBUM senatorum, the list of senators names, which was first introduced by Augustus, and renewed yearly.

ALBUM Judicum, that wherein the names of the persons of those *decuriæ* who judged at certain times were entered.

ALBUM Prætoris, that wherein the *formulae* of all actions, and the names of such judges as the prætor had chosen to decide causes, were written.

The high priest entered the chief transactions of each year into an *album*, or table, which was hung up in his house for the public use.

ALBUM is also used, in later times, to denote a kind of table, or pocket-book, wherein the men of letters with whom a person has conversed, inscribe their names with some sentence or motto.—The famous Algernon Sidney being in Denmark, was by the university of Copenhagen presented with their *album*, whereupon he wrote these words:

— — — *Manus hæc inimica tyrannis*

Ense petit placidam sub libertate quietem.

ALBUM Græcum, among physicians, the white dung of dogs, formerly prescribed for inflammations of the throat, &c. but now justly despised.

ALBUMAZAR, a learned Arabian astronomer in the tenth century, who wrote a treatise *Of the Revolution of the Years*.

ALBUMEN, the white of an egg. For its nature, origin, and office, see **EGG**.

The white of an egg, according to Boerhaave, makes an extraordinary menstruum. Being boiled hard in the shell, and afterwards suspended in the air by a thread, it resolves and drops down into an insipid, scentless, liquor, which appears to be that anomalous unaccountable menstruum so much used by Paracelsus; and will, though it contain nothing sharp, oleaginous, or saponaceous, make a thorough solution of myrrh; which is more than either water, oil, spirits, or even fire itself, can effect.

A little putrid white of egg taken into the stomach, occasions a nausea, horror, fainting, vomiting, diarrhoea, and gripes; it inflames the bile, excites heat, thirst, fever; and dissolves the humours like the plague. On the contrary, the white of fresh-laid eggs, if taken while warm from the hen, is extremely nourishing to the infirm: it may be taken in luke-warm milk; but if any other heat is applied to it, the nutritious quality will be destroyed. The fresh white of egg prevents burns from rising in blisters, if it is used immediately after the accident: it mitigates inflammations of the eyes, and preserves the face from sun-burning. In pharmacy, it is used as a medium to render balsams and turpentine, &c. miscible with aqueous fluids; but as it disagrees with many stomachs when thus taken, a mucilage of gum arabic may supply its place, it being as

good a medium in similar circumstances, and not apt to offend the tenderest stomach.—Whites of eggs are also useful for clarifying liquors; to which purpose, being mixed and incorporated with the liquors to be clarified, and the whole afterwards boiled, the whites of eggs are by this means brought together and hardened, and thus carry off the gross parts of the liquor along with them.

ALBUQUERQUE, a small city in Spain, in the province of Estremadura, is seated on an eminence, nine miles from the frontiers of Portugal. It is commanded by an almost impregnable fortress, built on a high mountain, and serving to defend the town. It carries on a great trade in wool and woollen manufactures. It was taken by the allies of Charles king of Spain in 1705. W. Long. 7. 0. N. Lat. 38. 52.

ALBURN, the English name of a compound colour, being a mixture of white and red, or reddish brown. Skinner derives the word, in this sense, from the Latin *albus*, and the Italian *burno*, from *bruno*, "brown."

ALBURNUM, the soft white substance which in trees is found between the liber or inner bark and the wood, and in progress of time acquiring solidity, becomes itself the wood. From its colour and comparative softness, it has been styled by some writers the fat of trees, *adeps arborum*.

The alburnum is found in largest quantities in trees that are vigorous; though in such as languish, or are sickly, there is a great number of beds. In an oak six inches in diameter, this substance is nearly equal in bulk to the wood. In a trunk of one foot diameter, it is as one to three and a half; of two and a half feet diameter, as one to four and a half, &c. but these proportions vary according to the health and constitution of the trees.—The alburnum is frequently gnawed in pieces by insects, which lodge in the substance, and are nourished from it.

ALBURNUS, in zoology, a species of the *cyprinus* of Linnæus. See **CYPRINUS**.

ALCA, or **AUK**, in ornithology, a genus of the order of anseres. The beak of this genus is without teeth, short, convex, compressed, and frequently furrowed transversely: the inferior mandible is gibbous near the base; the feet have generally three toes. The species of the alca are 12; of which the most remarkable are,

1. The impennis, northern penguin, or great auk, with a compressed bill furrowed on each side, and an oval spot on each side of the eyes. According to Mr. Martin, this bird breeds on the isle of St Kilda; appearing there the beginning of May, and retiring the middle of June. It lays one egg, which is six inches long, of a white colour; some are irregularly marked with purplish lines crossing each other, others blotched with black, and ferruginous about the thicker end: if the egg is taken away, it will not lay another that season. Mr Macaulay informs us that it does not visit that island annually, but sometimes keeps away for several years together; and adds, that it lays its egg close to the sea-mark, being incapable, by reason of the shortness of its wings, to mount higher. The length of this bird, to the end of its toes, is three feet: but its wings are so small, as to be useless for flight; the length, from the tip of the longest quill-feathers to the

Albu-
querque
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Alca.

Alca.

the first joint, being only four inches and a quarter. This bird is observed by seamen never to wander beyond soundings; and according to its appearance they direct their measures, being then assured that land is not very remote. It sometimes frequents the coasts of Norway, the Ferroe isles, Iceland, Greenland, and Newfoundland; and feeds much on the lump-fish, father-lasher, and other fish of that size. The young birds eat rose-root, and other plants. The old ones are very rarely seen on shore, tho' the young ones are not unfrequently met with. It is a very shy bird. It walks ill; but dives well, and is taken in the manner used for the razor-bill and puffin. The skin between the jaws is blown into a bladder, and used for the darts of the Greenlanders, as is also that of some other birds. The skin of the body is supposed to be used by the Esquimaux Indians for garments.

2. The alle, little auk, or black and white diver, with a smooth conical bill, a white streak on the belly, and wings, and black feet. The bulk of this species exceeds not that of a blackbird. It is not very common in Britain, being only met with now and then. It seems to be most plentiful towards the north, being met with in various parts as far as Spitzbergen. It is common in Greenland, in company with the black-billed species; feeds on the same food; and lays two blueish white eggs, larger than those of a pigeon. It flies quick, and dives well; and is always dipping its bill into the water while swimming or at rest on the water. It grows fat in the stormy season, from the waves bringing plenty of crabs and small fish within its reach; but from its size it is less sought after than the others. In Greenland it is called the *ice-bird*, being the harbinger of ice. This species is sometimes seen of a pure white.

3. The arctica, or puffin, with a compressed bill and four furrows; the orbit of the eyes and temples are white. The legs of this species are very small; and placed so far behind as to disqualify it from standing except quite erect, resting not only on the foot, but the whole length of the leg. This circumstance * makes the rise of the puffin from the ground very difficult, and it meets with many falls before it gets on wing; but when that is effected, few birds fly longer or stronger. These birds frequent the coasts of several parts of Great Britain and Ireland; but no place in greater numbers than Priestholm isle, where their flocks may be compared to swarms of bees for multitude. These are birds of passage; they resort there annually about the fifth or tenth of April, quit the place (almost to a bird), and return twice or thrice before they settle to burrow and prepare for ovation and incubation. They begin to burrow the first week in May; but some few save themselves that trouble, and dislodge the rabbits from their holes, taking possession of them till their departure from the isle. Those which form their own burrows, are at that time so intent on the work as to suffer themselves to be taken by the hand. This task falls chiefly to the share of the males; who also assist in incubation. The first young are hatched the beginning of July. The old ones show vast affection towards them; and seem totally insensible of danger in the breeding season. If a parent is taken at that time, and suspended by the wings, it will in a sort of despair treat itself most cruelly, by biting every part it can

* It attends every one of the genus.

reach; and the moment it is loosed, will never offer to escape, but instantly resort to its unfledged young: this affection ceases at the stated time of migration, which is most punctually about the 11th of August, when they leave such young as cannot fly to the mercy of the peregrine falcon, who watches the mouths of the house for the appearance of the little deserted puffins, which, forced by hunger, are compelled to leave their burrows. They lay only one egg. The eggs differ much in form: some have one end very acute; others have both extremely obtuse; all are white. Their flesh is excessively rank, as they feed on sea-weeds and fish, especially sprats: but when pickled and preserved with spices, are admired by those who love high-eating. Dr Caius tells, that in his days the church allowed them in lent instead of fish: he also acquaints us, that they were taken by means of ferrets, as we take rabbits: at present, they are either dug out, or drawn from their burrows by a hooked stick: they bite extremely hard; and keep such fast hold on whatever they fasten, as not to be easily disengaged. Their noise, when taken, is very disagreeable; being like the efforts of a dumb person to speak. These birds are also common in Ireland; on the island Sherries, three leagues N. N. W. of Holyhead; and in the S. Stack, near Holyhead, they breed in plenty. They inhabit Iceland and Greenland; and breed in the extreme parts of the islands. It is also found in the Ferroe isles, where it is called *Lunda*; and in the Farn isles, where it is called *Coulter-neb*, from the shape of the bill. It goes also by various other names; such as *Gulden-head*, *Bottle-nose*, and *Helegug*, in Wales; at Scarborough, *Mullet*; and in Cornwall, *Pope*. In America they are said to frequent Carolina in winter; and have been met with in Sandwich Sound by our late voyagers: the natives ornament the fore parts and collar of their seal-skins jackets with the beaks of them; and those of Aoonalashka wear gowns of their skins, along with those of other birds. On the coast of Kamtschatka and the Kurulski islands they are common, even on the Penschinski Bay, almost as far as Ochotka: the nations of the two first wear the bills about their necks fastened to straps; and, according to the superstition of these people, their shaman or priest must put them on with a proper ceremony, in order to procure good fortune.

4. The torda, or razor-bill, with four furrows on the bill, and a white line on each side running from the bill to the eyes. These birds, in company with the guillemot, appear in our seas the beginning of February; but do not settle on their breeding places till they begin to lay, about the beginning of May. They inhabit the ledges of the highest rocks that impend over the sea, where they form a grotesque appearance; sitting close together, and in rows one above another. They properly lay but one egg a-piece, of an extraordinary size for the bulk of the bird, being three inches long: it is either white, or of a pale sea-green, irregularly spotted with black: if this egg is destroyed, both the auk and the guillemot will lay another; if that is taken, then a third: they make no nest, depositing their egg on the bare rock; and though such multitudes lay contiguous, by a wonderful instinct each distinguishes its own. What is also matter of great amazement, they fix their egg on the smooth rock with so exact a balance, as to secure it from rolling off; yet should

Alca.

Alca.

should it be removed, and then attempted to be replaced by the human hand, it is extremely difficult, if not impossible, to find its former equilibrium. According to Mr Latham, it is by means of a cement that the bird fixes its egg. The eggs are food to the inhabitants of the coast they frequent, which they get with great hazard, being lowered from above by ropes, trusting to the strength of their companions, whose footing is often so unstable that they are forced down the precipice, and perish together. These birds are found in the north of Europe, also in Iceland, Greenland, and on the coast of Labrador. In Europe they extend along the White Sea into the Arctic Asiatic shores, and from thence to Kamtschatka and the gulph of Ochotka: It is the only one which reaches the inland Baltic; being found there on the Carls-Ozar isles, near Gothland, and the isle of Bondon off Angermania.

5. The pica, or black-billed auk, has the bill of the same form with the torda, but is entirely black. The cheeks, chin, and throat are white: in all other respects it agrees with the former species. Mr Latham is of opinion that it is no other than the young of that species. Mr Pennant observes, that it is sometimes found on our coasts; but, according to Mr Latham, it is in the winter-season only, when the common sort has quitted them. They are said to be met with on the coast of Candia, and other parts of the Mediterranean; "where no doubt (Mr Latham observes) the complete old bird is likewise found, as I have been informed that they are common in the bay of Gibraltar, where it is curious to see their activity under water when pursuing the fish; for, as the water in the bay is sometimes clear for a great depth from the surface, these birds may be often seen as it were flying after their prey, with all the agility of a bird in the air, turning in every direction after the fish, with such wonderful address and dexterity as seldom to miss their aim."

6. The cirrhata of Dr Pallas, or tufted auk, somewhat bigger than the common puffin, and the colours much the same: the bill is an inch and three-quarters in length, the same in depth at the base, and crossed with three furrows: over each eye arises a tuft of feathers four inches in length, which falls elegantly on each side of the neck, reaching almost to the back; and are white as far as they are attached to the head, but afterwards of a fine buff yellow: the legs are of a bright red; the claws black. The female is principally distinguished by having the bill crossed only with two furrows instead of three. This species inhabits the shores of Kamtschatka, the Kurile islands, and those intervening between Kamtschatka and America. In manners it greatly resembles the puffin; living all day at sea, but at no great distance from the rocks; it comes on shore at night; burrows a yard deep under ground, and makes a nest with feathers and sea-plants; is monogamous, and lodges there the whole night with its mate. It lays one white egg, the end of May or beginning of June, which alone is thought fit to be eaten, the flesh of the bird itself being insipid and hard. It feeds on crabs, shrimps, and shell-fish, which last it forces from the rocks with its strong bill. Pallas remarks, that the Kamtschatkan girls imitate the tufts of these birds, which nature has supplied them

Vol. I. Part I.

with, by placing a similar strip of the white skin of the glutton behind each ear, hanging down behind by way of ornament; and is a well-received present from a lover to his mistress. The bills both of this and the common puffin were formerly held by the natives as a charm, and worn by the priests as amulets; indeed at the present these have been seen fixed round their head-dresses, but supposed now to be only esteemed as mere ornaments: the skins are, however, made use of for clothing, being sewed together. It is called in Kamtschatka *Muechagatka*; and in Oschotka, *Igilma*.

7. The plittacula, or perroquet auk, of Dr Pallas, is about the size of the little auk. The bill is much compressed on the sides, in shape convex both above and below, and of a bright red colour: from the remote corner of each eye is a very slender tuft of fine white feathers, hanging down the neck: the head and upper part of the body are dusky; the lower whitish, varied with black edges: the legs are of a dirty yellow; and the webs dusky. This species is found at Kamtschatka, in the isles towards Japan, and on the western shores of America. They are sometimes seen in flocks, but seldom far from land, except when driven by storms. Of nights they harbour in the crevices of rocks. They lay an egg almost the size of a hen's, of a dirty white or yellowish colour spotted with brown; which they do about the middle of June, upon the bare rock or sand, for they make no nest. Like most of the tribe, they are stupid birds, as may be evinced by the ridiculous method of catching them: One of the natives places himself under a loose garment of fur, of a particular make, with large open sleeves, among the rocks at evening; when the birds, returning to their lodging-places at dusk, run under the skirts, and up the arm-holes, for shelter during the night, and thus become an easy prey. Their stupidity likewise occasions them to fly aboard a ship at such times, mistaking it for a roosting-place; whereby navigators have been taught to avoid the danger of falling in too near with land, either of evenings, or on approaching storms. The eggs are esteemed good.

ALCÆUS, a famous ancient lyric poet, born at Mitylene, in the island of Lesbos. Horace seems to think him the inventor of this kind of poetry:

Now the Roman muse inspire,
And warm the song with Grecian fire. *Francis.*

He flourished in the 44th Olympiad, at the same time with Sappho, who was likewise of Mitylene. Alcæus was a great enemy to tyrants, but not a very brave soldier. He was present at an engagement, wherein the Athenians gained a victory over the Lesbians; and here, as he himself is said to have confessed in one of his pieces, he threw down his arms, and saved himself by flight. Horace, who, of all the Latin poets, most resembled Alcæus, has made the like confession:

With thee I saw Philippi's plain,
Its fatal rout, a fearful scene!
And dropp'd, alas! th' inglorious shield,
Where valour's self was forc'd to yield;
Where soil'd in dust the vanquish'd lay,
And breath'd th' indignant soul away. *Francis.*

The poetical abilities of Alcæus are undisputed; and

Z z

though

Alca.
Alcaeus.

Alcæus,
Alcaics.

though his writings were chiefly in the lyric strain, yet his muse was capable of treating the sublimest subjects with a suitable dignity. Hence Horace says,

Alcæus strikes the golden strings,
And seas, and war, and exile, sings.
Thus while they strike the various lyre,
The ghosts the sacred sounds admire:
But when Alcæus lifts the strain
To deeds of war and tyrants slain,
In thicker crowds the shadowy throng
Drink deeper down the martial song. *Francis.*

ALCÆUS, an Athenian tragic poet, and, as some think, the first composer of tragedies. He renounced his native country Mitylene, and passed for an Athenian. He left ten pieces, one of which was *Pasiphaë*, that which he produced when he disputed with Aristophanes, in the fourth year of the 97th Olympiad.

There is another ALCÆUS mentioned in Plutarch, perhaps the same whom Porphyrius mentions as a composer of satirical iambics and epigrams, and who wrote a poem concerning the plagiarism of Euphorus the historian. He lived in the 145th Olympiad.

We are told likewise of one ALCÆUS, a Messenian, who lived in the reign of Vespasian and Titus. We know not which of these it was who suffered for his lewdness a very singular kind of death, which gave occasion to the following epitaph:

Ἀλκαίου ταφος ὑπὸ, &c.

This is Alcæus's tomb; who died by a radish,
The daughter of the earth, and punisher of Adulterers.

This punishment inflicted on adulterers, was thrusting one of the largest radishes up the anus of the adulterer: or, for want of radishes, they made use of a fish with a very large head, which Juvenal alludes to:

Quosdam mæchos et mugilis intrat. Sat. x.
The mullet enters some behind.

Hence we may understand the menace of Catullus,

*Ah! tum te miserum, malique fati,
Quem attractis pedibus, patente porta,
Percurrent raphanique mugilesque. Epig. xv.*

Ah! wretched thou, and born to luckless fate,
Who art discover'd by the unshut gate!
If once, alas! the jealous husband come,
The radish or the sea-fish is thy doom.

ALCAICS, in ancient poetry, a denomination given to several kinds of verse, from Alcæus, their inventor.

The first kind consists of five feet, viz. a spondee, or iambic; an iambic; a long syllable; a dactyle; another dactyle: such is the following verse of Horace,

*Omnes | eo | dem cogimur, | omnium
Versa | tur ur | nâ | serius | ocyus |
Sors exitura.*

The second kind consists of two dactyles and two trochees: as,

Exili | um imposi | tura | cymbæ.

Besides these two, which are called *dactylic Alcaics*, there is another styled simply *Alcaic*; consisting of an epitrite; a choriambus; another choriambus; and a bacchiuss: the following is of this species,

Cur timet fla | vum Tiberim tan | gere, cur | olivum ?

ALCAIC Ode, a kind of manly ode composed of several strophes, each consisting of four verses; the two first of which are always Alcaics of the first kind; the third verse is a diameter hypercatalectic, or consisting of four feet and a long syllable; and the fourth verse is an Alcaic of the second kind. The following strophe is of this species, which Horace calls *minaces Alcai camenæ*.

*Non possidentem multa vocaveris
Recte beatum: rectius occupat
Nomen beati, qui deorum
Muneribus sapienter uti, &c.*

ALCAID, ALCAYDE, or ALCALDE, in the polity of the Moors, Spaniards, and Portuguese, a magistrate, or officer of justice, answering nearly to the French provost and the British justice of peace.—The alcaid among the Moors is vested with supreme jurisdiction, both in civil and criminal cases.

ALCALA DE GUADEIRA, a small town of Spain, in Andalusia, upon the river Guadeira. Here are abundance of springs, from whence they convey water to Seville by an aqueduct. W. long. 6. 16. N. lat. 37. 15.

ALCALA de Henares, a beautiful and large city of Spain, in New Castile, seated upon the river Henares, which washes its walls. It is built in a very agreeable plain, and is of an oval figure. The streets are handsome and pretty straight; one of them is very long, running from one end of the city to the other. The houses are well built; and there are several squares, the largest of which is an ornament to the city; it is surrounded on all sides with piazzas, where tradesmen have their shops, to expose several sorts of commodities to sale, of which there is as great plenty and variety as in most towns of Spain. The university was founded by cardinal Ximenes, archbishop of Toledo, about the beginning of the 16th century. The land about Alcala is watered by the Henares, well cultivated, and very fruitful, while that at a distance is dry and sterile; it yields grain in plenty, very good muscat wine, and melons of a delicious kind. Without the walls is a spring, the water of which is so pure and so well tasted, that it is inclosed and shut up for the king of Spain's own use, from whence it is carried to Madrid.—This city is 10 miles south-west of Guadalaxara, and 13 miles east of Madrid. W. long. 4. 20. N. lat. 40. 30.

ALCALA-Real, a small city of Spain, in Andalusia, with a fine abbey. It is built on the top of a high mountain, in a mountainous country; and the road to it is incommodious, rough, and unequal; but to make amends for this, here are several kinds of exquisite fruit and wine. W. long. 4. 15. N. lat. 37. 18.

ALCALY, or ALCALI, or ALKALI. See CHEMISTRY. Index.

ALCANIS, a town of Arragon in Spain, seated on the river Guadaloupe, twelve miles from Caspe. It was formerly the capital of the kingdom of the Moors; but being taken from them, it was made a commandery of the order of Calatrava. Here is a very remarkable fountain, which throws up water through 42 pipes. It is surrounded with gardens and fruit-trees, and defended with a good fortress. W. long. 0. 5. N. lat. 41. 0.

ALCANNA, in commerce, a powder prepared from the

Alenic
||
Alcanna.

Alcantara the leaves of the Egyptian privet, in which the people of Cairo drive a considerable trade. It is much used by the Turkish women to give a golden colour to their nails and hair. In dyeing, it gives a yellow colour when steeped with common water, and a red one when infused in vinegar. There is also an oil extracted from the berries of Alcanna, and used in medicine as a calmer.

ALCANTARA, a small, but very strong city of Extremadura, in Spain. It gives name to one of the three orders of knighthood. It is seated on the banks of the Tajo, or Tagus, 21 miles from Coria, in a very fruitful soil, and is celebrated for its bridge over that river. This was built in the time of the emperor Trajan, as appears by an inscription over one of the arches, by the people of Lusitania, who were assailed to supply the expence. It is raised 200 feet above the level of the water; and though it consists but of six arches, is 670 feet in length, and 28 in breadth. At the entrance of the bridge, there is a small antique chapel hewn in a rock by the ancient Pagans, who dedicated it to Trajan, as the Christians did to St Julian. This city was built by the Moors, on account of the convenience of this bridge, which is at a place where the Tajo is very deep, running between two high steep rocks: for this reason, they called it *Al-Cantara*, which, in their language, signifies *the Bridge*. It was taken from them in 1214, and given to the knights of *Calatrava*, who afterwards assumed the name of *Alcantara*. It was taken by the Earl of Galloway, in April 1706, and retaken by the French in November following. It is 45 miles from Madrid, and 125 from Seville. W. Long. 7. 12. N. Lat. 39. 30.

Knights of ALCANTARA, a military order of Spain, which took its name from the above mentioned city. They make a very considerable figure in the history of the expeditions against the Moors. The knights of Alcantara make the same vows as those of Calatrava, and are only distinguished from them by this, that the cross fleur de lys, which they bear over a large white cloak, is of a green colour. They possess 37 commanderies. By the terms of the surrender of Alcantara to this order, it was stipulated, that there should be a confraternity between the two orders, with the same practices and observances in both; and that the order of Alcantara should be subject to be visited by the grand-master of Calatrava. But the former soon released themselves from this engagement, on pretence that their grand-master had not been called to the election of that of Calatrava, as had been likewise stipulated in the articles. After the expulsion of the Moors, and the taking of Granada, the sovereignty of the order of Alcantara and that of Calatrava was settled in the crown of Castile by Ferdinand and Isabella.—In 1540, the knights of Alcantara sued for leave to marry, which was granted them.

ALCAREZ, a small city of La Mancha, in Spain, defended by a pretty strong castle, and remarkable for an ancient aqueduct. It stands near the river Guardamena, and the soil about it is very fruitful. They have a breed of little running-horses, which are very fleet and strong. It is 25 miles north of the confines of Andalusia, 108 south of Cuenza, and 138 south-by-east of Madrid. W. Long. 1. 50. N. Lat. 38. 28.

ALCASSAR DO SAL, a town of Portugal in Estre-

madura, which has a castle said to be impregnable. It is indeed very strong, both by art and nature, being built on the top of a rock which is exceedingly steep on all sides. Here is a salt-work which produces very fine white salt, from whence the town takes its name. The fields produce large quantities of a sort of rushes, of which they make mats, which are transported out of the kingdom. W. Long. 9. 10. N. Lat. 38. 18.

ALCASSAR, a city of Barbary, seated about two leagues from Larache, in Asga, a province of the kingdom of Fez. It was of great note, and the seat of the governor of this part of the kingdom. It was built by Jacob Almanzor, king of Fez, about the year 1180, and designed for a magazine and place of rendezvous for the great preparations he was making to enter Granada in Spain, and to make good the footing Joseph Almanzor had got some time before. It is said his father first invaded Spain with 300,000 men, most of whom he was obliged to bring back to Africa to quiet a rebellion that had broke out in Morocco. This done, he returned to Spain again with an army, as is said, of 200,000 horse and 300,000 foot. The city is now fallen greatly to decay, so that of fifteen mosques there are only two that they make use of. The reason, probably, is the bad situation of the town; for it stands so low, that it is excessively hot in summer, and almost overflowed with water in the winter. This they affirm to be owing to a curse of one of their saints. Here are a great number of storks, who live very familiarly with the people, walking about the town, possessing the tops of the houses and mosques without molestation; for they esteem them sacred birds, and account it sinful to disturb them. At present, the bashaw of Tetuan appoints a governor to this town, which is the last of his dominions towards Mequinez. Near this city there is a high ridge of mountains, running towards Tetuan, whose inhabitants were never brought entirely under subjection; and whenever it was attempted, they revenged themselves by infesting the roads, and robbing and destroying the travellers. When they were pursued, they retired into their woody mountains, where none could safely follow them. Not far from hence is the river Elmahassen, famous for the battle fought between Don Sebastian king of Portugal and the Moors; in which the Portuguese were defeated and their king slain. W. Long. 12. 35. N. Lat. 35. 15.

ALCAVALA, in the Spanish finances, was at first a tax of ten per cent. afterwards of fourteen per cent. and is at present of only six per cent. upon the sale of every sort of property, whether moveable or immoveable; and it is repeated every time the property is sold. The levying of this tax requires a multitude of revenue-officers sufficient to guard the transportation of goods, not only from one province to another, but from one shop to another. It subjects not only the dealers in some sort of goods, but those in all sorts, every farmer, every manufacturer, every merchant and shopkeeper, to the continual visits and examination of the tax-gatherers. Through the greater part of a country in which a tax of this kind is established, nothing can be produced for distant sale. The produce of every part of the country must be proportioned to the consumption of the neighbourhood. It is to the Alcala, accordingly, that Ustaritz imputes the ruin of the manufactures of Spain. He might have imputed

Alcassar.
Alcala.

Alcazar
||
Alcea.

ted to it likewise the declension of agriculture, it being imposed not only upon manufactures, but upon the rude produce of the land.

ALCAZAR LEGUER, a town of Africa, in the kingdom of Fez, and in the province of Ilabat. It was taken by Alphonso, king of Portugal, in 1468; but soon after that, it was abandoned to the Moors. It is seated on the coast of the straits of Gibraltar. W. Long. 5. 30. N. Lat. 38. 0.

ALCAZER, a town of Spain, in New Castile, seated on the river Guardamana, which has a fortress on a high hill for its defence, and lies in a very fruitful country. It is 100 miles north-west of Carthage. W. Long. 2. 10. N. Lat. 38. 15.

ALCE, **ALCES**, or **ELK**, in zoology, the trivial name of a species of the cervus, belonging to the order of mammalia pecora. See **CERVUS**.

ALCEA, the **HOLLY-HOCK**: A genus of the polyandria order, belonging to the monodelphia class of plants; and in the natural method ranking under the 37th order, *Columnifera*. The characters are: The calyx is a double perianthium, monophyllous and persistent; the exterior one six-cleft, the interior half five-cleft: The corolla consists of five petals, coalesced at the base, heart-shaped inversely, and expanding: The stamina consist of numerous filaments, coalesced below into a five-cornered cylinder, loose above, and inserted into the corolla; the antheræ are kidney-shaped: The pistillum has a roundish germen; a short cylindric stylus; and numerous bristly stigmata the length of the stylus; The pericarpium consists of many arilli, jointed into a verticillum about a columnar depressed receptacle: The seeds are solitary, reniform, and depressed.

Species. Although Linnæus mentions two distinct species of this genus, viz. the *rosea* and *ficifolia*, he thinks, that the latter may perhaps be only a variety of the former; but Mr Miller affirms them to be distinct species, whose difference in the form of their leaves always continues. The leaves of the first sort are roundish, and cut at their extremities into angles; those of the second are deeply cut into six or seven segments, so as to resemble a hand. Cultivation produces an almost infinite variety of this plant, such as double-flowered, single-flowered, deep red, pale red, blackish red, white, purple, yellow, and flesh-colour. The first species is a native of China, the second grows also in Istria. Tho' natives of warm countries, they are hardy enough to thrive in the open air in Britain, and have for many years been some of the greatest ornaments in gardens, towards the end of summer; but they have the inconvenience of growing too large for small gardens, and requiring tall stakes to secure them from being broken by strong winds. In large gardens, however, when properly disposed, they make a fine appearance; for as their spikes of flowers grow very tall, there will be a succession of them on the same stems more than two months; the flowers on the lower part of the spike appear in July; and as their stalks advance, new flowers are produced till near the end of September. When planted in good ground, the stalks will often rise to the height of eight or nine feet; so that near six feet of each will be garnished with flowers, which, when double and of good colours, make a very beautiful appearance.

Culture. The holly-hock is propagated by seeds,

which should be carefully saved from those plants whose flowers are double and of the best colours: for though the duplicity of the flowers, as well as their colour, are only accidental properties, yet the young plants will produce nearly the same kind of flowers with those from which the seeds are taken, provided no plants with single or bad-coloured flowers are permitted to grow near them; and as soon as such appear they ought to be removed from the good ones, that their farina may not spread into the others, which would cause them to degenerate. The seeds ought to be gathered very dry, and remain in their capsules until spring; but care must be taken that no wet comes to them in winter, otherwise the covers would turn mouldy, and spoil their contents.—They should be sown in drills, about the middle of April, on a bed of light earth, and covered with earth of the same kind about half an inch deep. When the plants have put out six or eight leaves, they should be transplanted into nursery-beds, observing to water them until they have taken good root; after which they will require no farther care, but to keep them clean from weeds till October, when they should be transplanted where they are to remain.

ALCEDO, or **KINGFISHER**, in ornithology, a genus of the order of picæ. The alcedo has a long, straight, thick, triangular bill; with a fleshy, plain, short, flat tongue.

Of this genus there are a great many species, with one or other of which almost every part of the world is furnished. Most of them frequent rivers, and live on fish, the singularity of catching which is admirable: sometimes hovering over the water, where a shoal of small fishes is seen playing near the surface; at other times waiting with attention, on some low branch hanging over the water, for the approach of a single one who is so unlucky as to swim that way; in either case dropping like a stone, or rather darting with rapidity on its prey; when, seizing it crosswise in its bill, it retires to a resting place to feast on it; which it does piecemeal, bones and all, without reserve, afterwards bringing up the indigestible parts in pellets, like birds of prey. The wings of most of the genus are very short; yet the birds fly rapidly, and with great strength. It may be remarked, that throughout this genus, blue, in different shades, is the most predominant colour.—The species found in the South Sea Islands are held in a kind of superstitious veneration by the natives of the places they severally inhabit, perhaps on account of their being frequently seen flying about the morais or burial-places. That which inhabits Otaheite, where it is called *Erooro*, is accounted particularly sacred, and not allowed to be taken or killed.

1. The ispada, or common kingfisher, is not much larger than a swallow; its shape is clumsy; the bill disproportionably long; it is two inches from the base to the tip; the upper chap black, and the lower yellow. But the colours of this bird atone for its inelegant form: the crown of the head and the coverts of the wings are of a deep blackish green, spotted with bright azure: the back and tail are of the most resplendent azure; the whole under-side of the body is orange-coloured; a broad mark of the same passes from the bill beyond the eyes; beyond that is a large white spot: the tail is short, and consists of twelve feathers of a rich deep blue;

Alcedo.

Alcedo.

blue; the feet are of a reddish yellow, and the three joints of the outmost toe adhere to the middle toe, while the inner toe adheres only by one.

From the diminutive size, the slender short legs, and the beautiful colours of this bird, no person would be led to suppose it one of the most rapacious little animals that skims the deep. Yet it is for ever on the wing, and feeds on fish; which it takes in surprising quantities, when we consider its size and figure. It takes its prey after the manner of the osprey, balancing itself at a certain distance above the water for a considerable space, then darting into the deep, and seizing the fish with inevitable certainty. While it remains suspended in the air, in a bright day, the plumage exhibits a beautiful variety of the most dazzling and brilliant colours. This striking attitude did not escape the notice of the ancients; for Ibycus, as quoted by Athenæus, styles these birds *αλκυονες τανυσσιπτεροι*, the halcyons with expanded wings. It makes its nest in holes in the sides of the cliffs, which it scoops to the depth of three feet; and lays from five to nine eggs, of a most beautiful semi-transparent white. The female begins to lay early in the season, and excludes her first brood about the beginning of April. The male, whose fidelity exceeds even that of the turtle, brings her large provisions of fish while she is thus employed; and she, contrary to most other birds, is found plump and fat at that season. The male, that used to twitter before this, now enters the nest as quietly and as privately as possible. The young ones are hatched at the expiration of 20 days; but are seen to differ as well in their size as in their beauty.

This species is the *αλκυοναφρων*, or mute halcyon of Aristotle, which he describes with more precision than is usual with that great philosopher. After his description of the bird follows that of its nest; than which the most inventive of the ancients have delivered nothing that appears at first sight more fabulous and extravagant. He relates, that it resembled those concretions that are formed by the sea-water; that it resembled the long-necked gourd; that it was hollow within; that the entrance was very narrow, so that, should it overset, the water could not enter; that it resisted any violence from iron, but could be broke with a blow from the hand; and that it was composed of the bones of the *βελονη*, or sea-needle. The nest had medical virtues ascribed to it; and from the bird was called *Halcyoneum*. In a fabulous age, every odd substance that was flung ashore received that name; a species of tubular coral, a sponge, a zoophite, and a miscellaneous concrete, having by the ancients been dignified with that title from their imaginary origin†. Yet much of this seems to be founded on truth. The form of the nest is justly described; and the materials which Aristotle says it was composed of, are not entirely of his own invention. Whoever has seen the nest of the kingfisher will observe it strewed with the bones and scales of fish; the fragments of the food of the owner and its young.—On the foundation laid by the philosopher, succeeding writers formed other tales extremely absurd; and the poets, indulging the powers of imagination, dressed the story in all the robes of romance. This nest was a floating one:

Incubat *halcyone* pendentibus æquore nidis.

OVID. Met. lib. xi.

It was therefore necessary to place it in a tranquil sea, and to supply the bird with charms to allay the fury of a turbulent element during the time of its incubation; for it had, at that season, power over the seas and the winds.

Χ' αλκυονες φορησευντι τα κυματα, την τε θαλασσαν,
Τον τε νοτον, τον τ' ευρον, ος εσχατα φυκια κινει
Αλκυονης, γλαυκαίς Νηρησι ται τε μαλιστα
Ορνιθων επιλαθεν. THEOCRIT. Idyl. vii. l. 57.

May *Halcyons* smooth the waves, and calm the seas,
And the rough south-east sink into a breeze;
Halcyons, of all the birds that haunt the main,
Most lov'd and honour'd by the *Nereid* train.

FAWKES.

These birds were equally favourites with Thetis as with the Nereids:

Dilectæ *Thetidi* *Halcyones*. VIRG. Georg. I. 399.

as if to their influence these deities owed a repose in the midst of the storms of winter, and by their means were secured from those winds that disturb their submarine retreats, and agitated even the plants at the bottom of the ocean.

Such are the accounts given by the Roman and Sicilian poets. Aristotle and Pliny tells us, that this bird is most common in the seas of Sicily: that it sat only a few days, and those in the depth of winter; and during that period the mariner might sail in full security; for which reason they were styled *Halcyon days*.

Perque dies placidos hiberno tempore septem
Incubat *Halcyone* pendentibus æquore nidis:
Tum via tuta maris: ventos custodit, et arcet
Æolus egressu. OVID. Met. lib. xi.

Alcyone, comprefs'd,

Seven days sits brooding on her watery nest,
A wintry queen; her fire at length is kind,
Calms every storm, and hushes every wind.

DRYDEN.

In after-times, these words expressed any season of prosperity: these were the *Halcyon days* of the poets; the brief tranquillity, the *septem placidi dies*, of human life.

The poets also made it a bird of song. Virgil seems to place it in the same rank with the linnet;

Littoraque *Halcyonem* resonant, et *Acanthida* dumi.
GEORG. III. 338.

And Silius Italicus celebrates its music, and its floating nest:

Cum sonat *Halcyone* cantu, nidisque natantes
Immota gestat sopitis fluctibus unda. LIB. xiv. 275.

But these writers seem to have transferred to our species the harmony that belongs to the *vocal alcedo*†, one of the lost birds of the ancients.

As the ancients have had their fables concerning this bird, so have the modern vulgar. It is an opinion generally received among them, that the flesh of the kingfisher will not corrupt, and that it will even banish all vermin. This has no better foundation than that which is said of its always pointing, when hung up dead, with its breast to the north. The only truth which can be affirmed of this bird when killed is, that its

Alcedo.

† Plin. lib.
xii. c. 8.
Diosc. lib.
v. c. 94.

† Arist.
Hist. an.
892.

Alcedo.

its flesh is utterly unfit to be eaten; while its beautiful plumage preserves its lustre longer than that of any other bird we know.

This bird is found not only in Britain, but throughout Europe, Asia, and Africa; as specimens have been received from both China, Bengal, and Egypt. Be- lon also remarks his having met with it in Romania and Greece; and Scopoli notices it as a bird of Car- niola, where he says it remains the whole year as in England. Indeed it bears the rigours of the colder climates so well, that among the Germans it has gained the name of *Eisvogel*, or *Ice Bird*: Olin speaks also of its not regarding the ice and cold; and Gmelin assures us, that it is found even in Tartary and Sibe- ria. But, however this may be, there are few winters in which many of these birds do not perish, apparently from cold alone; as several have been found frozen stiff by the sides of even running water, without the least mark of violence about them. M. D'Aubenton has kept these birds for several months, by means of small fish put into basins of water, on which they have fed; for on experiment they have refused all other kinds of nourishment.

2. The rudis, or Egyptian kingfisher, as described by Hasselquist, is the size of the Royston crow. The bill is blackish, more than half an inch broad at the base, and two inches in length: the head, shoulders, and back, are brown, marked with oblong ferruginous spots: the throat is of a ferruginous white: the belly and thighs are whitish, marked with longitudinal broad- ish cinereous spots: the upper tail coverts quite white: the quills spotted with white on the inner webs, chiefly at the tips: the tail is ash-coloured: the legs are of a pale green; and the claws blackish. It inhabits lower Egypt, about Cairo; builds in sycamore and date trees; and feeds on frogs, insects, and small fish, which last it meets with in the fields when they are overflowed. Its cry is not unlike that of the common crow.

3. Le taparara of Buffon is about the size of a starling. The upper mandible of the bill is black, the lower red: the hind part of the neck, the back, and scapulars, are of an elegant blue; the rump and upper tail coverts bright beryl-blue: the under parts of the body are white; the wing coverts blue; and the legs red. Inhabits Cayenne and Guiana, at which last place the natives call all the kingfisher tribe by the name *Taparara*. In this part of South America, which contains many rivers full of fish, kingfishers, as might be expected, abound in vast numbers: but what is re- markable, they never herd together, always being found single, except in breeding-time, which is about the month of September. They lay their eggs in the holes of banks, like the kingfisher of Europe. The cry of this bird imitates the word *Carac*.

4. The torquata, or cinereous kingfisher, is about the size of a magpie, and fifteen inches and a half in length. The bill is three inches and a half long, and brown; the base of the lower mandible reddish: the head is crested: the upper parts of the head and body are blueish ash; the under parts chestnut: the throat is whitish, descending down the neck, and passing be- hind like a collar, ending towards the back in a point: the under tail coverts are of a pale fulvous, transverse- ly striated with black: lesser wing coverts varied with blueish, ash, black, and yellowish: the legs are red;

and the claws blackish. It inhabits Martinico and Mexico; at which last it is called *Achalalahtli*. This bird migrates into the northern parts of Mexico at cer- tain seasons only, and is supposed to come there from some hotter parts.

[The jacamars are much allied to this genus, and have been ranked under it by Linnæus: Their toes are, however, differently placed; their food also is different, being insects alone, and not fish; and their haunts are different, being moist woods, and not shores or the banks of rivers.]

5. The galbula, or green jacamar, is about the size of a lark. The bill is black, of a square form, a little incurved and sharp at the point: the plumage in ge- neral, in the upper part of the body, is of a most bril- liant green, glossed with copper and gold in different lights: the belly, throat, and vent, are rufous: the tail is composed of ten feathers, and shaped like a wedge: the legs are of a greenish yellow, very short and weak; the claws are black. This species is found both in Guiana and Brasil, in the moist woods, which it prefers to the more dry spots, for the sake of insects, on which it feeds. It is seldom seen except single, as it is a very solitary bird, keeping for the most part in the thickest parts; its flight quick, but short; perches on branches of a middling height, where it sits all night, and frequently part of the day, without stir- ring. Though these birds are solitary, yet they are far from scarce, as many may be met with. They are said to have a short and agreeable note. The natives of Guiana call this bird *Venetore*, and the Creoles, *Colibri des grands bois*. At Brasil their flesh is eaten by some.

6. The paradisea, or paradise jacamar, is of the same size with the former, and has a similar bill: the throat, fore part of the neck, and under wing coverts, are white: the rest of the plumage is of a deep dull green, in some lights appearing almost black, in others with a slight gloss of violet and copper bronze: the tail is composed of twelve feathers of unequal lengths: the two middle ones longest: the legs are black: the toes are placed two before and two behind, and pretty much united. It inhabits Surinam; and like the others, it feeds on insects; and sometimes, contrary to them, frequents open places. It flies farther at a time, and perches on the tops of trees: It is frequent- ly found with a companion, not being quite so solitary a bird as the other. It also differs in the note, having a kind of soft whistle often repeated, but not heard a great way off.

Above 30 other species have been described by orni- thologists.

ALCHEMILLA, or LADIES-MANTLE: A genus of the monogynia order, belonging to the tetrandria class of plants; and in the natural method ranking under the 35th order *Senticose*. The *calyx* is a single-leav'd perianthium, tubular, and persistent; the mouth flat, and eight-parted. There is no *corolla*. The *stamina* consist of four small erect subulated filaments placed in the mouth of the calyx; the antheræ are roundish: The *pistillum* has an egg-shaped *germen*: The *stylus* is filiform, the length of the stamina, and inserted at the base of the germ: The stigma is globular. There is no *pericarpium*, but the neck of the calyx closed. The *seed* solitary, elliptical, and compressed. Of this genus there are three

Alcedo, Alchemilla.

Species.

Alchemist,
Alchemy.

Species. 1. The vulgaris, or common ladies-mantle, with leaves plated like a fan, and yellowish-green blossoms. It grows naturally in pasture-lands in this as well as in most other countries in Europe. The leaves discover to the taste a moderate astringency; and were formerly much esteemed in some female weaknesses, and in fluxes of the body. They are now rarely made use of, tho' both the leaves and roots might doubtless be of service in cases where mild astringents are required. In the province of Smolandia in Gothland, they make a tincture of the leaves, and give it in spasmodic or convulsive diseases. Horses, sheep, and goats, eat it; cows are not fond of it; swine refuse it.—2. The alpina, or cinque-foil ladies-mantle, with finger-shaped sawed leaves, and greenish blossoms. It is a native of the mountainous parts of Europe. Goats and cows eat it; horses, sheep, and swine, refuse it.—3. The minor, or least ladies-mantle, with five smooth leaves growing at a joint and cut into many segments. It grows naturally in Sweden, Lapland, and other cold countries. Eaten by cows and goats; refused by horses, sheep, and swine.

Culture. These plants have perennial roots, and annual stalks. They are easily propagated by parting of their roots, or sowing their seed in autumn. They should have a moist soil and shady situation, and be kept clean from weeds; which is all the culture they require.

ALCHEMIST, a practitioner in alchemy.

ALCHEMY, that branch of chemistry which had for its principal objects the transmutation of metals into gold; the panacea, or universal remedy; an alkalest, or universal menstruum; an universal ferment; and many other things equally ridiculous.

Kircher, instructed in all the secrets of chemistry, has fully exposed the artifices and impostures of alchemists. An alchemist puts into a crucible the matter which is to be converted into gold; this he sets on the fire, blows it, stirs it with rods; and, after divers operations, gold is found at the bottom of the crucible, instead of the matter first put in: this there are a thousand ways of effecting, without any transmutation. Sometimes it is done by dexterously dropping in a piece of gold concealed between the fingers, sometimes by casting in a little of the dust of gold or silver disguised under the appearance of some elixir, or other indifferent matter; sometimes a crucible is used which has a double bottom, and gold put between the two; sometimes the rod used to stir the matter is hollow, and filled with the dust of the metal desired; at other times there is metal mixed with the charcoal, the ashes of the furnace, or the like. Mr Harris very properly distinguishes from alchemy and chemistry; and defines the former to be *ars sine arte, cujus principium est mentiri, medium laborare, et finis mendicare*; and the Italians have a proverb, *non ti fidare al alchemista po-vero o medico amalato*. The ruin which has attended this delusion has occasioned several states to make severe laws against pretences to alchemy. The Romans formerly banished all such as professed it; and the sacred canons likewise directed the thunder of their censure against them. Dioclesian and Cæsar directed all books which treated of this subject to be burnt. Rymer furnishes us with a licence for practising alchemy, with all kinds of metals and minerals, granted to one

Richard Carter in the 1476; *Rym. Fæd.* tom. xii. Nevertheless, we have had severe laws against alchemy, and multiplying of metals, as much so as against coining itself.

ALCIAT (Andrew), a great lawyer, who flourished in the 16th century, born at Milan. He mixed much of polite learning in the explication of the laws, and happily drove out the barbarity of language which till then had reigned in the lectures and writings of lawyers; for which Thuanus highly praises him. He published a great many law-books, and some notes upon Tacitus. His Emblems have been much admired, and translated into French, Italian, and Spanish; and several learned men have written commentaries on them.

ALCIBIADES, an Athenian general. It was the fate of this great man to live at a time when his country was a scene of confusion. The Greeks, grown insolent from their conquests in Persia, turned their army against each other, and bandied together under the conduct of the two most opulent states, Athens and Lacedæmon. Alcibiades, in the midst of an expedition he had planned against the enemy of his country, was recalled home to answer some charge of a private nature; but fearing the violence of his enemy, instead of going to Athens, he offered his services at Sparta, where they were readily accepted. By his advice the Lacedæmonians made a league with Persia, which gave a very favourable turn to their affairs. But his credit in the republic raising jealousies against him, he privately reconciled himself to his country, and took again the command of an Athenian army. Here victory, waiting as it were at his command, attended all his motions. The loss of seven battles obliged the Spartans to sue for peace. He enjoyed his triumphs, however, only a short time at Athens. One unsuccessful event made him again obnoxious to the malice of his citizens; and he found it expedient to retire from Athens. In his absence the Spartans again took the lead, and at the fatal battle of Ægos entirely subdued the Athenian power. Alcibiades, though an exile, endeavoured to restore the power of his country; of which the Spartans having intelligence, procured him to be assassinated. He was a man of admirable accomplishments, but indifferently principled; of great parts; and of an amazing versatility of genius.

ALCINOUS, a King of the Phœnicians, in the island now called *Corfu*, was son of Nautilous, and grandson of Neptune and Peribea. It is by his gardens this king has chiefly immortalized his memory. He received Ulysses with much civility, when a storm had cast him on his coast. The people here loved pleasure and good cheer, yet were skilful seamen; and Alcinous was a good prince.

ALCMAER, a city of the United Provinces, situated in North Holland, about four miles from the sea, 15 from Haerlem, and 18 from Amsterdam. It is a handsome city, and one of the cleanest in Holland. The streets and houses are extremely neat and regular, and the public buildings very beautiful. It had formerly two parish-churches, dedicated to St Matthew and St Lawrence. The latter had so high a tower, that it served for a sea-mark to the vessels that were in the open sea; but, in 1464, it tumbled down, and damaged the other church so much, that they were both

Alciat

Alcmaer.

Alcman
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Alcock.

both demolished in 1470, and one church was built in their stead, dedicated to the same saints. The Spaniards, under the command of Frederic of Toledo, son of the duke d'Alva, came to besiege it, after they had taken Haerlem in 1573; but were forced to raise the siege, after three months lying before it, as well on account of the infection of the air as the stout resistance of the inhabitants and soldiers; even the women signaling themselves bravely in its defence. It is recorded in the register of this city, that, in the year 1637, 120 tulips, with the off-sets, sold for 90,000 florins. The town has a very good trade in butter and cheese, of which a vast quantity is sold every year, and is esteemed the best in Holland. E. long. 4. 26. N. lat. 52. 28.

ALCMAN, a lyric poet, who flourished in the 27th Olympiad. He was born at Sparta; and composed several poems, of which only some fragments are remaining, quoted by Athenæus and some other ancient writers. He was very amorous; accounted the father of gallant poetry; and is said to have been the first that introduced the custom of singing love-songs in company. He is reported to have been one of the greatest eaters of his age; upon which Mr Bayle remarks, that such a quality would have been extremely inconvenient, if poetry had been at that time upon such a footing as it has been often since, not able to procure the poet bread. He died of a strange disease; for he was eat up with lice.

ALCMANIAN, in ancient lyric poetry, a kind of verse consisting of two dactyles and two trochees; as,—

Virgini|bus pue|risque | canto.

The word is formed from *Alcman*, the name of an ancient Greek poet, in great esteem for his erotics or amorous compositions.

ALCMENA, the daughter of Eleftryo king of Mycenæ, and wife of Amphitryon. Jupiter putting on the shape of her husband while he was abroad in the wars, begot Hercules upon her: he made that night as long as three ordinary ones.

ALCOCK (John), doctor of laws, and bishop of Ely in the reign of king Henry VII. was born at Beverly in Yorkshire, and educated at Cambridge. He was first made dean of Westminster, and afterwards appointed master of the rolls. In 1471, he was consecrated bishop of Rochester; in 1476, he was translated to the see of Worcester; and in 1486, to that of Ely, in the room of Dr John Morton, preferred to the see of Canterbury. He was a prelate of great learning and piety; and so highly esteemed by king Henry, that he appointed him lord president of Wales, and afterwards lord chancellor of England. Alcock founded a school at Kingston upon Hull, and built the spacious hall belonging to the episcopal palace at Ely. He was also the founder of Jesus-college in Cambridge, for a master, six fellows, and as many scholars. This house was formerly a nunnery, dedicated to St Radigund: and, as Godwin tells us, the building being greatly decayed, and the revenues reduced almost to nothing, the nuns had all forsaken it, except two; whereupon bishop Alcock procured a grant from the crown, and converted it into a college. But Camden and others tell us, that the nuns of that house were so notorious for their incontinence, that king Henry VII. and pope Julius II. consented to its dissolution: N^o. 10.

Bale accordingly calls this nunnery *spiritualium meretricum cœnobium*, "a community of spiritual harlots." Bishop Alcock wrote several pieces; amongst which are the following: 1. *Mons Perfectionis*. 2. *In Psalmos Penitenciales*. 3. *Homiliæ Vulgares*. 4. *Meditationes Piæ*. He died October 1. 1500; and was buried in the chapel he had built at Kingston upon Hull.

ALCOHOL, or ALKOOL, in chemistry, spirit of wine highly rectified*. It is also used for any highly rectified spirit.—Alcohol is extremely light and inflammable: It is a strong antiseptic, and therefore employed to preserve animal substances.

ALCOHOL is also used for any fine impalpable powder.

ALCOHOLIZATION, the process of rectifying any spirit. It is also used for pulverization.

ALCOR, in astronomy, a small star adjoining to the large bright one in the middle of the tail of *ursa major*.—The word is Arabic. It is a proverb among the Arabians, applied to one who pretends to see small things, but overlooks much greater: *Thou canst see Alcor, and not yet see the full moon*.

ALCORAN, or AL-KORAN, the scripture, or bible, of the Mahometans. The word is compounded of the Arabic particle *al*, and *coran* or *koran*, derived from the verb *caraa* or *karaa*, to read. The word therefore properly signifies, *the reading*; or rather, *that which ought to be read*. By this name the Mahometans denote not only the entire book or volume of the Koran, but also any particular chapter or section of it; just as the Jews call either the whole scripture, or any part of it, by the name of *Karah*, or *Mikra*, words of the same origin and import.

Besides this peculiar name, the Koran is also honoured with several appellations common to other books of scripture: as, *al Farkan*, from the verb *foraka*, to divide or distinguish; not, as the Mahometan doctors say, because those books are divided into chapters or sections, or distinguish between good and evil; but in the same notion that the Jews use the word *Perek*, or *Pirka*, from the same root, to denote a section or portion of scripture. It is also called *al Mojhaf*, the volume, and *al Kitah*, the book, by way of eminence, which answers to the *Biblia* of the Greeks; and *al Dhikr*, the admonition, which name is also given to the Pentateuch and Gospel.

The Koran is divided into 114 larger portions of very unequal length, which we call *chapters*; but the Arabians *sowar*, in the singular *sura*; a word rarely used on any other occasion, and properly signifying a row, order, or a regular series; as a course of bricks in building, or a rank of soldiers in an army; and is the same in use and import with the *Sura*, or *Tora*, of the Jews, who also call the fifty-three sections of the Pentateuch *Sedarim*, a word of the same signification.

These chapters are not, in the manuscript copies, distinguished by their numerical order, but by particular titles, which are taken sometimes from a particular matter treated of, or person mentioned therein; but usually from the first word of note, exactly in the same manner as the Jews have named their *Sedarim*; though the word from which some chapters are denominated be very far distant, towards the middle, or perhaps the end, of the chapter; which seems ridiculous. But the occasion of this appears to have been, that the verse or passage

Alcohol
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Alcoran.

* See Chemistry (Index), and Pharmacy.

Alcoran. passage wherein such word occurs, was, in point of time, revealed and committed to writing before the other verses of the same chapter which precede it in order; and the title being given to the chapter before it was completed, or the passages reduced to their present order, the verse from whence such title was taken did not always happen to begin the chapter. Some chapters have two or more titles, occasioned by the difference of the copies.

Some of the chapters having been revealed at Mecca, and others at Medina, the noting this difference makes a part of the title: but the reader will observe, that several of the chapters are said to have been revealed partly at Mecca and partly at Medina; and, as to others, it is yet a dispute among the commentators to which of the two places they belong.

Every chapter is subdivided into smaller portions, of very unequal length also, which we customarily call *verses*: but the Arabic word is *ayat*, the same with the Hebrew *ototh*, and signifies *signs* or *wonders*: such as are the secrets of God, his attributes, works, judgments, and ordinances, delivered in those verses; many of which have their particular titles also, imposed in the same manner as those of the chapters.

Besides these unequal divisions of chapter and verse, the Mahometans have also divided their Koran into sixty equal portions, which they call *Ahzab*, in the singular *Hizb*, each subdivided into four equal parts; which is also an imitation of the Jews, who have an ancient division of their Mishna into sixty portions called *Masseoth*. But the Koran is more usually divided into thirty sections only, named *Ajza* from the singular *Joz*, each of twice the length of the former, and in the like manner subdivided into four parts. These divisions are for the use of the readers of the Koran in the royal temples, or in the adjoining chapels where the emperors and great men are interred. There are thirty of these readers belonging to every chapel, and each reads his section every day; so that the whole Koran is read over once a-day.

Next after the title, at the head of every chapter, except only the ninth, is prefixed the following solemn form, by the Mahometans called the *Bismallah*, IN THE NAME OF THE MOST MERCIFUL GOD; which form they constantly place at the beginning of all their books and writings in general, as a peculiar mark or distinguishing characteristic of their religion, it being counted a sort of impiety to omit it. The Jews, for the same purpose, make use of the form, *In the name of the LORD*, or, *In the name of the great God*; and the eastern Christians that of, *In the name of the Father, and of the Son, and of the Holy Ghost*. But Mahomet probably took this form, as he did many other things, from the Persian Magi, who used to begin their books in these words, *Benam Yezdam bakshaisgher dadar*; that is, *In the name of the most merciful just God*.

There are twenty-nine chapters of the Koran, which have this peculiarity, that they begin with certain letters of the alphabet, some with a single one, others with more. These letters the Mahometans believe to be the peculiar marks of the Koran, and to conceal seve-

VOL. I. Part I.

Alcoran. ral profound mysteries; the certain understanding of which, the more intelligent confess, has not been communicated to any mortal, their prophet only excepted. Notwithstanding which, some will take the liberty of guessing at their meaning by that species of Cabala called by the Jews *Notarikon*, and suppose the letters to stand for as many words, expressing the names and attributes of God, his works, ordinances, and decrees; and therefore these mysterious letters, as well as the verses themselves, seem in the Koran to be called *signs*. Others explain the intent of these letters from their nature or organ, or else from their value in numbers, according to another species of the Jewish Cabala called *Gematria*; the uncertainty of which conjectures sufficiently appears from their disagreement. Thus, for example, five chapters, one of which is the second, begins with these letters, A. L. M. which some imagine to stand for *Allah latiff magid*, "God is gracious and to be glorified;" or, *Ana li minni*, i. e. *to me and from me*, viz. belongs all perfection, and proceeds all good; or else for *Ana Allah alam*, "I am the most wise God," taking the first letter to mark the beginning of the first word, the second the middle of the second word, and the third the last of the third word; or for *Allah, Gabriel, Mohammed*, the author, revealer, and preacher of the Koran. Others say, that as the letter A belongs to the lower part of the throat, the first of the organs of speech; L to the palate, the middle organ; and M to the lips, which are the last organ; so these letters signify that God is the beginning, middle, and end, or ought to be praised in the beginning, middle, and end, of all our words and actions: or, as the total value of those three letters, in numbers, is seventy-one, they signify, that, in the space of so many years, the religion preached in the Koran should be fully established. The conjecture of a learned Christian is at least as certain as any of the former, who supposes those letters were set there by the amanuensis, for *Amar li Mohammed*, i. e. *at the command of Mohammed*, as the five letters prefixed to the nineteenth chapter seem to be there written by a Jewish scribe, for *Coh yaas*, i. e. *Thus he commanded*.

The Koran is universally allowed to be written with the utmost elegance and purity of language, in the dialect of the tribe of Koreish, the most noble and polite of all the Arabians, but with some mixture, tho' very rarely, of other dialects. It is confessedly the standard of the Arabic tongue, and, as the more orthodox believe, and are taught by the book itself, inimitable by any human pen (though some sectaries have been of another opinion), and therefore insisted on as a permanent miracle, greater than that of raising the dead, and alone sufficient to convince the world of its divine original.

And to this miracle did Mahomet himself chiefly appeal for the confirmation of his mission, publicly challenging the most eloquent men in Arabia, which was at that time stocked with thousands whose sole study and ambition it was to excel in elegance of style and composition, to produce even a single chapter that might be compared with it (A).

3. A

To

(A) As the composition and arrangement of words, however, admit of infinite varieties, it can never be absolutely said that any one is the best possible. In fact, Hamzah Benahmed wrote a book against the Alcoran with at least equal elegance; and Moselema another, which even surpassed it, and occasioned a defection of a great part of the Mussulmans. *Journ. des Scav.* tom. xiii. p. 280. *Ouvr. de Scav.* Nov. 1708, p. 404.

Alcoran.

To the pomp and harmony of expression some ascribe all the force and effect of the Alcoran; which they consider as a sort of music, equally fitted with other species of that art to ravish and amaze. In this Mahomet succeeded so well, and so strangely captivated the minds of his audience, that several of his opponents thought it the effect of witchcraft and enchantment, as he himself complains.—Others have attributed the effect of the Alcoran to the frequent mention of rewards and punishments; heaven and hell occurring almost in every page. Some suppose, that the sensual pleasures of paradise, so frequently set before the imaginations of the readers of the Alcoran, were what chiefly bewitched them. Tho', with regard to these, there is a great dispute whether they are to be understood literally or spiritually. Several have even allegorized the whole book.

The general design of the Koran was to unite the professors of the three different religions, then followed in the populous country of Arabia (who for the most part lived promiscuously, and wandered without guides, the far greater number being idolaters, and the rest Jews and Christians mostly of erroneous and heterodox belief), in the knowledge and worship of one God, under the sanction of certain laws, and the outward signs of ceremonies partly of ancient and partly of novel institution, enforced by the consideration of rewards and punishments both temporal and eternal; and to bring them all to the obedience of Mahomet, as the prophet and ambassador of God, who, after the repeated admonitions, promises, and threats, of former ages, was at last to establish and propagate God's religion on earth, and to be acknowledged chief pontiff in spiritual matters, as well as supreme prince in temporal.

The great doctrine then of the Koran, is the unity of God; to restore which point Mahomet pretended was the chief end of his mission; it being laid down by him as a fundamental truth, That there never was, nor ever can be, more than one true orthodox religion. For, though the particular laws or ceremonies are only temporary, and subject to alteration, according to the divine direction; yet the substance of it being eternal truth, is not liable to change, but continues immutably the same. And he taught, that, whenever this religion became neglected, or corrupted in essentials, God had the goodness to re-inform and re-admonish mankind thereof, by several prophets, of whom Moses and Jesus were the most distinguished, till the appearance of Mahomet, who is their seal, and no other to be expected after him. The more effectually to engage people to hearken to him, great part of the Koran is employed in relating examples of dreadful punishments formerly inflicted by God on those who rejected and abused his messengers; several of which stories, or some circumstances of them, are taken from the Old and New Testaments, but many more from the apocryphal books and traditions of the Jews and Christians of those ages, set up in the Koran as truths in opposition to the scriptures, which the Jews and Christians are charged with having altered: and indeed, few or none of the relations or circumstances in the Koran were invented by Mahomet, as is generally supposed, it being easy to trace the greatest part of them much higher, as the rest might be, were more of those books extant, and was it worth while to make the inquiry.

The rest of the Alcoran is taken up in prescribing

necessary laws and directions, frequent admonitions to moral and divine virtues, the worship and reverence of the Supreme Being, and resignation to his will. One of their most learned commentators distinguishes the contents of the Alcoran into *allegorical* and *literal*; under the former are comprehended all the obscure, parabolical, and enigmatical passages, with such as are repealed, or abrogated; the latter, such as are clear, and in full force.

The most excellent moral in the whole Alcoran, interpreters say, is that in the chapter *Al Alraf*, viz. Shew mercy, do good to all, and dispute not with the ignorant; or, as Mr Sale renders it, Use indulgence, command that which is just, and withdraw far from the ignorant. Mahomet, according to the authors of the *Keschaf*, having begged of the angel Gabriel a more ample explication of this passage, received it in the following terms: "Seek him who turns thee out, give to him who takes from thee, pardon him who injures thee; for God will have you plant in your souls the roots of his chief perfections." It is easy to see that this commentary is copied from the gospel.—In reality, the necessity of forgiving enemies, though frequently inculcated in the Alcoran, is of a later date among the Mahometans than among the Christians; among those latter, than among the heathens; and to be traced originally among the Jews. (See Exodus xxxiii. 4, 5.) But it matters not so much who had it first, as who observes it best. The caliph Hassan, son of Hali, being at table, a slave unfortunately let fall a dish of meat reeking hot, which scalded him severely. The slave fell on his knees, rehearsing these words of the Alcoran, "Paradise is for those who restrain their anger." I am not angry with thee, answered the caliph.—"And for those who forgive offences against them," continues the slave. I forgive thee thine, replies the caliph.—"But above all, for those who return good for evil," adds the slave. I set thee at liberty, rejoined the caliph; and I give thee ten dinars.

There are also a great number of occasional passages in the Alcoran, relating only to particular emergencies. For this advantage Mahomet had in the piecemeal method of receiving his revelation, that whenever he happened to be perplexed and gruelled with any thing, he had a certain resource in some new morsel of revelation. It was an admirable contrivance of his, to bring down the whole Alcoran at once, only to the lowest heaven, not to earth; since, had the whole been published at once, innumerable objections would have been made, which it would have been impossible for him to solve: but as he received it by parcels, as God saw fit they should be published for the conversion and instruction of the people, he had a sure way to answer all emergencies, and to extricate himself with honour from any difficulty which might occur.

It is the general and orthodox belief among the Mahometans, that the Koran is of divine original; nay, that it is eternal and uncreated, remaining, as some express it, in the very essence of God: that the first transcript has been from everlasting by God's throne, written on a table of vast bigness called the *preserved table*, in which are also recorded the divine decrees past and future: that a copy from this table, in one volume on paper, was by the ministry of the angel Gabriel sent down to the lowest heaven, in the month of Ramadan, on the night of

Alcoran.

Alcoran.

of power: from whence Gabriel revealed it to Mahomet by parcels, some at Mecca, and some at Medina, at different times, during the space of 23 years, as the exigency of affairs required; giving him, however, the consolation to show him the whole (which they tell us was bound in silk, and adorned with gold and precious stones of paradise) once a-year; but in the last year of his life he had the favour to see it twice. They say, that few chapters were delivered entire, the most part being revealed piecemeal, and written down from time to time by the prophet's amanuensis in such a part of such and such a chapter, till they were completed, according to the directions of the angel. The first parcel that was revealed is generally agreed to have been the first five verses of the 96th chapter.

After the new-revealed passages had been from the prophet's mouth taken down in writing by his scribe, they were published to his followers; several of whom took copies for their private use, but the far greater number got them by heart. The originals, when returned, were put promiscuously into a chest, observing no order of time; for which reason it is uncertain when many passages were revealed.

When Mahomet died, he left his revelations in the same disorder, and not digested into the method, such as it is, in which we now find them. This was the work of his successor Abu Becr; who, considering that a great number of passages were committed to the memory of Mahomet's followers, many of whom were slain in their wars, ordered the whole to be collected, not only from the palm-leaves and skins on which they had been written, and which were kept between two boards or covers, but also from the mouths of such as had gotten them by heart. And this transcript, when completed, he committed to the custody of Hassa the daughter of Omar, one of the prophet's widows.

From this relation it is generally imagined that Abu Becr was really the compiler of the Koran; though, for aught appears to the contrary, Mahomet left the chapters complete as we now have them, excepting such passages as his successor might add or correct from those who had gotten them by heart; what Abu Becr did else, being perhaps no more than to range the chapters in their present order, which he seems to have done without any regard to time, having generally placed the longest first.

However, in the 30th year of the Hegira, Othman being then caliph, and observing the great disagreement in the copies of the Koran in the several provinces of the empire; those of Irak, for example, following the reading of Aba Musa al Ashari, and the Syrians that of Macdad Ebn Aswad; he, by the advice of the companions, ordered a great number of copies to be transcribed from that of Abu Becr, in Hassa's care, under the inspection of Zeid Ebn Thabet, Abd'allah Ebn Zobair, Said Ebn al As, and Ad'alrahman Ebn al Hareth the Makhzumite; whom he directed, that, wherever they disagreed about any word, they should write it in the dialect of the Koreish, in which it was at first delivered. These copies, when made, were dispersed in the several provinces of the empire, and the old ones burnt and suppressed. Though many things in Hassa's copy were corrected by the abovementioned revisers, yet some few various readings still occur.

In fine, the book of the Alcoran is held in the highest

esteem and reverence among the Musselmans. They dare not so much as touch the Alcoran without being first washed, or legally purified; to prevent which, an inscription is put on the cover or label, *Let none touch but they who are clean.* It is read with great care and respect; being never held below the girdle. They swear by it; take omens from it on all weighty occasions; carry it with them to war; write sentences of it in their banners; adorn it with gold and precious stones; and knowingly suffer it not to be in the possession of any of a different religion. Some say that it is punishable even with death, in a Christian, to touch it; others, that the veneration of the Musselmans leads them to condemn the translating it into any other language as a profanation: but these seem to be aggravations. The Mahometans have taken care to have their scripture translated into the Persian, the Javan, the Malayan, and other languages; tho', out of respect to the original, these versions are generally, if not always, interlineated.

“By the advocates of Mahometanism, the Koran, as already observed, has always been held forth as the greatest of miracles, and equally stupendous with the act of raising the dead. The miracles of Moses and Jesus, they say, were transient and temporary; but that of the Koran is permanent and perpetual; and therefore far surpasses all the miraculous events of preceding ages. We will not detract from the real merit of the Koran: we allow it to be generally elegant, and often sublime: but at the same time we reject with disdain its arrogant pretence to any thing supernatural; all the real excellence of the work being easily referable to natural and visible causes.

“In the language of Arabia, a language extremely loved and diligently cultivated by the people to whom it was vernacular, Mahomet found advantages which were never enjoyed by any former or succeeding impostor. It requires not the eye of a philosopher to discover in every soil and country a principle of national pride: and if we look back for many ages on the history of the Arabians, we shall easily perceive that pride among them invariably to have consisted in the knowledge and improvement of their native language. The Arabic, which has been justly esteemed the most copious of the Eastern tongues; which had existed from the remotest antiquity; which had been embellished by numberless poets, and refined by the constant exercise of the natives; was the most successful instrument which Mahomet employed in planting his new religion among them. Admirably adapted by its unrivalled harmony, and by its endless variety to add painting to expression, and to pursue the imagination in its unbounded flight; it became in the hands of Mahomet an irresistible charm to blind the judgment, and to captivate the fancy of his followers.

“Of that description of men, who first composed the adherents of Mahomet, and to whom the Koran was addressed, few, probably, were able to pass a very accurate judgment on the propriety of the sentiments, or on the beauties of the diction: but all could judge of the military abilities of their leader; and in the midst of their admiration it is not difficult to conceive, that they would ascribe to his compositions every imaginary beauty of inspired language.

“The shepherd and the soldier, though awake to the

Alcoran.

View of
Christianity
and Maho-
metanism,
p. 257.

Alcoran. charms of those wild but beautiful compositions, in which were celebrated their favourite occupations of love or war, were yet little able to criticise any other works than those which were addressed to their imagination or the heart. To abstract reasonings on the attributes and the dispensations of the Deity, to the comparative excellencies of rival religions, to the consistency of any one religious system in all its parts, and to the force of its various proofs, they were quite inattentive. In such a situation, the appearance of a work which possessed something like wisdom and consistence; which prescribed the rules, and illustrated the duties of life; and which contained the principles of a new and comparatively sublime theology, independently of its real and permanent merit, was likely to excite their astonishment, and to become the standard of future composition.

"In the first periods of the literature of every country, something of this kind has happened. The father of Grecian poetry very obviously influenced the taste and imitation of his countrymen. The modern nations of Europe all possess some original author, who, rising from the darkness of former ages, has begun the career of composition, and tinged with the character of his own imagination the stream which has flowed through his posterity.

"But the prophet of Arabia had in this respect advantages peculiar to himself. His compositions were not to his followers the works of man, but the genuine language of Heaven, which had sent him. They were not confined therefore to that admiration which is so liberally bestowed on the earliest productions of genius, or to that fond attachment with which men every where regard the original compositions of their country: but with their admiration they blended their piety. To know and to feel the beauties of the Koran, was in some respect to share in the temper of heaven; and he who was most affected with admiration in the perusal of its beauties, seemed most fitly the object of that mercy which had given it to ignorant man. The Koran, therefore, became naturally and necessarily the standard of taste. With a language thus hallowed in their imaginations, they were too well satisfied, either to dispute its elegance or improve its structure. In succeeding ages, the additional sanction of antiquity, or prescription, was given to these compositions which their fathers had admired: and while the belief of its divine original continues, that admiration, which has thus become the test and the duty of the faithful, can neither be altered nor diminished.

"When therefore we consider these peculiar advantages of the Koran, we have no reason to be surprised at the admiration in which it is held. But if, descending to a more minute investigation of it, we consider its perpetual inconsistency and absurdity, we shall indeed have cause for astonishment at that weakness of humanity which could ever have received such compositions as the work of the Deity.

"The first praise of all the productions of genius, is invention; that quality of the mind, which, by the extent and quickness of its views, is capable of the largest conceptions, and of forming new combinations of objects the most distant and unusual. But the Koran bears little impression of this transcendent character. Its materials are wholly borrowed from the Jewish and

Christian scriptures, from the Talmudical legends and apocryphal gospels then current in the East, and from the traditions and fables which abounded in Arabia. The materials collected from these several sources are here heaped together, with perpetual and needless repetitions, without any settled principle or visible connection.

"When a great part of the life of Mahomet had been spent in preparatory meditation on the system he was about to establish, its chapters were dealt out slowly and separately during the long period of 23 years. Yet thus defective in its structure, and no less exceptionable in its doctrines, was the work which Mahomet delivered to his followers as the oracles of God.

"The most prominent feature of the Koran, that point of excellence in which the partiality of its admirers has ever delighted to view it, is the sublime notion it generally impresses of the nature and attributes of God. If its author had really derived these just conceptions from the inspiration of that Being whom they attempt to describe, they would not have been surrounded, as they now are on every side, with error and absurdity. But it might easily be proved, that whatever it justly defines of the divine attributes, was borrowed from our holy scripture; which even from its first promulgation, but especially from the completion of the New Testament, has extended the views and enlightened the understandings of mankind; and thus furnished them with arms, which have too often been ineffectually turned against itself by its ungenerous enemies.

"In this instance particularly, the copy is far below the great original, both in the propriety of its images, and the force of its descriptions. Our holy scriptures are the only compositions that can enable the dim sight of mortality to penetrate into the invisible world, and to behold a glimpse of the Divine perfections. Accordingly, when they would represent to us the happiness of Heaven, they describe it, not by any thing minute and particular, but by something general and great; something, that without descending to any determinate object, may at once by its beauty and immensity excite our wishes and elevate our affections. Though in the prophetic and evangelical writings the joys that shall attend us in a future state are often mentioned with ardent admiration, they are expressed rather by allusion than similitude, rather by indefinite and figurative terms, than by any thing fixed and determinate. 'Eye hath not seen, nor ear heard, neither have entered into the heart of man, the things which God hath prepared for them that love him.' 1 Cor. ii. 9. What a reverence and astonishment does this passage excite in every hearer of taste and piety? What energy, and at the same time what simplicity, in the expression? How sublime, and at the same time how obscure, is the imagery?

"Different was the conduct of Mahomet in his descriptions of heaven and of paradise. Unassisted by the necessary influence of virtuous intentions and Divine inspiration, he was neither desirous, nor indeed able, to exalt the minds of men to sublime conceptions, or to rational expectations. By attempting to explain what is inconceivable, to describe what is ineffable, and to materialize what in itself is spiritual; he absurdly and impiously aimed to sensualize the purity of the Divine essence. Thus he fabricated a system of incoherence, a religion of depravity, totally repugnant indeed to the nature

Alcoran. nature of that Being, who, as he pretended, was its object; but therefore more likely to accord with the appetites and conceptions of a corrupt and sensual age.

"That we may not appear to exalt our Scriptures thus far above the Koran by an unreasonable preference, we shall produce a part of the second chapter of the latter, which is deservedly admired by the Mahometans, who wear it engraved on their ornaments, and recite it in their prayers. 'God! there is no God but he; the living, the self-subsisting: neither slumber nor sleep seizeth him: to him belongeth whatsoever is in heaven, and on earth. Who is he that can intercede with him but through his good pleasure? He knoweth that which is past, and that which is to come. His throne is extended over heaven and earth, and the preservation of both is to him no burden. He is the high, the mighty.' *Sale's Kor.* ii. p. 30. 4to edit.

"To this description who can refuse the praise of magnificence? Part of that magnificence, however, is to be referred to that verse of the Psalmist, whence it was borrowed, 'He that keepeth Israel, shall neither slumber nor sleep.' *Psal.* cxxi. 4.

"But if we compare it with that other passage of the same inspired Psalmist, all its boasted grandeur is at once obscured, and lost in the blaze of a greater light.

"O my God, take me not away in the midst of my days; thy years are throughout all generations. Of old hast thou laid the foundations of the earth; and the heavens are the work of thy hands. They shall perish, but thou shalt endure; yea all of them shall wax old, as doth a garment; as a vesture shalt thou change them, and they shall be changed; but thou art the same, and thy years shall not fail."

"The Koran, therefore, upon a retrospective view of these several circumstances, far from supporting its arrogant claim to a supernatural work, sinks below the level of many compositions confessedly of human original; and still lower does it fall in our estimation, when compared with that pure and perfect pattern which we justly admire in the scriptures of truth.

"It is therefore abundantly apparent, that no miracle either was externally performed for the support, or is internally involved in the composition, of the Mahometan revelation."

ALCORAN, is also figuratively applied to certain other books full of impieties and impostures.—In this sense we meet with the *Alcoran* of the Cordeliers, which has made a great noise; wherein St Francis is extravagantly magnified and put on a level with Jesus Christ. The *Alcoran* of the Cordeliers is properly an extract of a very scarce book, intitled, The conformity of the life of the seraphic father St Francis with the life of Christ, published in 1510, 4to; since, at Bologna, in folio. Erasmus Albertus, being by the elector of Brandenburg appointed to visit a monastery of Franciscans, found this book; and being struck with the extreme folly and absurdity of it, collected a number of curiosities out of it, and published them under the title of the *Alcoran* of the Franciscans, with a preface by Martin Luther.

ALCORANISTS, among Mahometans, those who adhere strictly to the letter or text of the alcoran, from an opinion of its ultimate sufficiency and perfection.

The Persians are generally *Alcoranists*, as admitting the Alcoran alone for their rule of faith. The Turks, Tartars, Arabs, &c. besides the Alcoran, admit a multitude of traditions. The Alcoranists, among Mahometans, amount to much the same with the textuaries among the Jews. The Alcoranists can find nothing excellent out of the Alcoran; are enemies of philosophers, metaphysicians, and scholastic writers. With them the Alcoran is every thing.

ALCOVE, among builders, a recess, or part of a chamber separated by an eltrade, or partition of columns, and other corresponding ornaments, in which is placed a bed of state, and sometimes seats to entertain company. These alcoves are frequent in Spain; and the bed is raised two or three ascents, with a rail at the foot.

ALCUINUS (Flaccus), an ecclesiastic of the eighth century. Where he was born, is a matter of dispute; but according to the most probable opinion, it was in Yorkshire. It is pretty certain, however, that he was educated at York, under the direction of archbishop Egbert, as we learn from his own letters, in which he frequently calls that great prelate his beloved master, and the clergy of York the companions of his youthful studies. As he survived venerable Bede about 70 years, it is hardly possible that he could have received any part of his education under him, as some writers of literary history have affirmed; and it is worthy of observation, that he never calls that great man his master, though he speaks of him with the highest veneration. It is not well known to what preferments he had attained in the church before he left England, though some say he was abbot of Canterbury. The occasion of his leaving his native country, was his being sent on an embassy by Offa king of Mercia to the emperor Charlemagne; who contracted so great an esteem and friendship for him, that he earnestly solicited, and at length prevailed upon him, to settle in his court, and became his preceptor in the sciences. Alcuinus accordingly instructed that great prince in rhetoric, logic, mathematics, and divinity; which rendered him one of his greatest favourites. "He was treated with so much kindness and familiarity (says a cotemporary writer) by the Emperor, that the other courtiers called him, by way of eminence, *the emperor's delight*." Charlemagne employed his learned favourite to write several books against the heretical opinions of Felix Bishop of Urgel in Catalonia, and to defend the orthodox faith against that heresiarch, in the council of Francfort, A. D. 804; which he performed to the entire satisfaction of the Emperor and council, and even to the conviction of Felix and his followers, who abandoned their errors. The Emperor consulted chiefly with Alcuinus on all things relating to religion and learning; and, by his advice, did many great things for the advancement of both. An academy was established in the Imperial palace, over which Alcuinus presided, and in which the princes and prime nobility were educated; and other academies were established in the chief towns of Italy and France, at his instigation, and under his inspection. "France (says one of our best writers of literary history) is indebted to Alcuinus for all the polite learning it boasted of in that and the following ages. The universities of Paris, Tours, Fulden, Soissons, and many others,

Alcove,
Alcuinus,

Alcuinus owe to him their origin and increase; those of whom he was not the superior and founder, being at least enlightened by his doctrine and example, and enriched by the benefits he procured for them from Charlemagne." After Alcuinus had spent many years in the most intimate familiarity with the greatest prince of his age, he at length, with great difficulty, obtained leave to retire from court to his abbey of St Martin's at Tours. Here he kept up a constant correspondence by letters with Charlemagne; from which it appears, that both the emperor and his learned friend were animated with the most ardent love to learning and religion, and constantly employed in contriving and executing the noblest designs for their advancement. He composed many treatises on a great variety of subjects, in a style much superior in purity and elegance to that of the generality of writers in the age in which he flourished. Charlemagne often solicited him, with all the warmth of a most affectionate friend, to return to court, and favour him with his company and advice; but he still excused himself; and nothing could draw him from his retirement in his abbey of St Martin in Tours, where he died A. D. 804. His works were collected and published by Andrew du Chesne in one volume folio, Paris, 1617. They consist of, 1. Tracts upon scripture. 2. Tracts upon doctrine, discipline, and morality. 3. Historical treatises, letters, and poems. Since that edition, there has been published an incredible number of tracts, poems, &c. ascribed to this author, most of which, in all probability, were not his.

ALCYON, the trivial name of a species of alcedo. See ALCEDO.

ALCYONIUM, an obsolete name of a submarine plant. It is also used for a kind of coral, or asteroites, frequently found fossil in England.

ALCYONIUM Stagnum (anc. geog.), a lake in the territory of Corinth, whose depth was unfathomable, and in vain attempted to be discovered by Nero. Thro' this lake Bacchus is said to have descended to hell, to bring back Semele (Pausanias).

ALCYONIUS (Peter), a learned Italian, who flourished in the 16th century. He was well versed in the Greek and Latin tongues, and wrote some pieces of eloquence which met with great approbation. He was corrector of the press a considerable time for Aldus Manutius, and is intitled to a share in the praises given to the editions of that learned printer. He published a treatise concerning banishment, which contained so many fine passages intermixed with others quite the reverse, that it was thought he had tacked to somewhat of his own, several fragments of a treatise of Cicero de gloria; and that afterwards, in order to save himself from being detected in this theft, he burnt the manuscript of Cicero, the only one extant. Paulus Manutius, in his commentary upon these words of Cicero, *Librum tibi celeriter mittam de gloria*, "I will speedily send you my treatise on glory;" has the following passage relating to this affair: "He means (says he) his two books On Glory, which were handed down to the age of our fathers; for Bernard Justinian, in the index of his books, mentions Cicero de Gloria. This treatise, however, when Bernard had left his whole library to a nunnery, could not be found, though sought after with great care: nobody doubted but Peter Alcyonius, who, being physician to the nunnery,

was entrusted with the library, had basely stole it. And truly, in his treatise Of Banishment, some things are found interspersed here and there, which seem not to favour of Alcyonius, but of some higher author." The two orations he made after the taking of Rome, wherein he represented very strongly the injustice of Charles V. and the barbarity of his soldiers, were excellent pieces. There is also an oration ascribed to him, on the knights who died at the siege of Rhodes.

ALDBOROUGH, a sea-port town in Suffolk, with a market on Saturdays. It is pleasantly situated, in a dale, between a high hill to the westward, on which its large old-built church stands; the sea to the east, and its river running south-west. It is a large, long, ordinary town, made up of two or three streets of low houses, running parallel to each other. A quarter of a mile to the south lies Slaughden, where they have a commodious quay, with warehouses for fish: more southerly still, they have conveniences for drying their north-sea fish. Their employment in the fishery is their chief business, which is considerable in the seasons for catching herrings and sprats; and it is the only place in England for curing red sprats. It is a town corporate, and sends two members to parliament. Towards the sea, it has some pieces of cannon planted for its defence. It is 88 miles north-east from London. E. Long. 1. 32. N. Lat. 52. 50.

ALDBOROUGH, a market-town in the west-riding of Yorkshire, seated on the river Ouse, 15 miles north-west of York, and 200 miles north of London. It sends two members to parliament. W. Long. 0. 20. N. Lat. 54. 15. It was anciently a Roman city, called *Isurium Brigantium*; and several coins and monuments of the Saxons and Romans have been discovered there.

ALDEBARAN, in astronomy, a star of the first magnitude, called in English the *bull's eye*, as making the eye of the constellation Taurus. Its longitude is 6 deg. 32 min. 9 sec. of Gemini, and its latitude 5 deg. 29 min. 40 sec. south.

ALDER-TREE, in botany. See BETULA.

ALDERHOLM, a pleasant island of Sweden, formed by the three arms of a river running thro' Gentle, a town of Nordland, in Sweden. Here is a wharf, a repository for planks and deals, two packing houses, a large customhouse for taking toll of the ships, an arsenal for cannon, and a granary.

ALDERMAN, in the British policy, a magistrate subordinate to the lord-mayor of a city or town-corporate. The number of these magistrates is not limited, but is more or less according to the magnitude of the place. In London they are 26; each having one of the wards of the city committed to his care. This office is for life: so that when one of them dies, or resigns, a wardmote is called, who return the person they have chosen, to the court of aldermen; which court is obliged to admit him to supply the vacancy. All the aldermen are justices of the peace, by a charter of 15 Geo. II. The aldermen of London, &c. are exempted from serving inferior offices; nor shall they be put upon assizes, or serve on juries, so long as they continue to be aldermen.

ALDERMAN, among our Saxon ancestors, was a degree of nobility answering to earl or count at present.

ALDERMAN was also used, in the time of king Edgar, for a judge or justice. Thus we meet with the

Aldbo-
rough
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Alderman

Alderney, the titles of *Aldermannus totius Angliæ, aldermannus regis, comitatus, civitatis, burgi, castelli, hundredi five wapentachii, et novemdecimorum*. According to Speiman, the *aldermannus totius Angliæ* seems to have been the same officer who was afterwards styled *capitulis justiciarius Angliæ*, or chief-justice of England; the *aldermannus regis* seems to have been an occasional magistrate, answering to our justice of assize; and the *aldermannus comitatus*, a magistrate who held a middle rank between what was afterward called the *earl* and the *sheriff*; he sat at the trial of causes with the bishop: the latter proceeding according to ecclesiastical law, and the former declaring and expounding the common law of the land.

ALDERNEY, an island in the British channel, subject to the crown of Great Britain. It is about eight miles in compass, and is separated from Cape la Hogue, in Normandy, by a narrow strait, called the *Race of Alderney*, which is a very dangerous passage in stormy weather when the two currents meet; otherwise it is safe, and has depth of water for the largest ships. Thro' this strait the French fleet made their escape after their defeat at La Hogue in 1692. It is a healthy island, has but one church, is fruitful both in corn and pasture, and is remarkable for a fine breed of cows. The inhabitants, for their greater safety, live together in a town of the same name. The number of houses are said to be 200, and the inhabitants 1000. It has but one harbour, called *Crabby*, which is at a good distance from the town; and is only fit for small vessels. To the west lie the range of rocks called the *Caskets*, so dangerous to mariners. W. Long. 2 17. N. Lat. 49. 50.

ALDHELM (St), bishop of Shireburn in the time of the Saxon Heptarchy. He is said to have been the son of Kenred, brother to Ina, king of the West-Saxons; but in the opinion of William of Malmesbury, his father was no more than a distant relation to the king. Having received the first part of his education in the school which one Macdulf, a learned Scot, had set up in the place where Malmesbury now stands, he travelled into France and Italy for his improvement. At his return home, he studied some time under Adrian abbot of St Augustin's in Canterbury, the most learned professor of the sciences who had ever been in England. In these different seminaries he acquired a very uncommon stock of knowledge; and became famous for his learning, not only in England, but in foreign countries: whence several learned men sent him their writings for his perusal and correction; particularly Prince Arcivil, a son of the king of Scotland, who wrote many pieces which he sent to Aldhelm, "intreating him to give them the last polish, by rubbing off their Scots rust." He was the first Englishman who wrote in the Latin language both in prose and verse, and composed a book for the instruction of his countrymen in the profody of that language. Besides this, he wrote several other treatises on various subjects; some of which are lost, and others published by Martin Delrio and Canisius. Venerable Bede, who flourished in the end of this and the beginning of the next century, gives the following character of Aldhelm: "He was a man of universal erudition, having an elegant style, and being wonderfully well acquainted with books, both on philosophical and religious subjects." In fact, considering the cloud of ignorance by which he was

surrounded, and the great difficulty of acquiring knowledge without proper instruction, Aldhelm was a very extraordinary man. From one of his letters to Hedda bishop of Winchester, concerning the nature of his studies whilst at Canterbury, he appears to have been indefatigably determined to acquire every species of learning in his power. For a copy of this curious epistle, see Henry's History, vol. ii. p. 320. King Alfred the Great declared, that Aldhelm was the best of all the Saxon poets; and that a favourite song, which was universally sung in his time, near 200 years after its author's death, was of his composition. When he was abbot of Malmesbury, having a fine voice, and great skill in music as well as poetry, and observing the backwardness of his barbarous countrymen to listen to grave instructions, he composed a number of little poems, which he sung to them after mass in the sweetest manner; by which they were gradually instructed and civilized. After this excellent person had governed the monastery of Malmesbury, of which he was the founder, about 30 years, he was made bishop of Sherburn, where he died A. D. 709.—He wrote, 1. *De octo vitiis principalibus*. This treatise is extant in *Bibliotheca Patrum* of Canisius. 2. *Ænigmaticum versus mille*. This, with several other of his poems, was published by Martin Delrio at Mentz, 8vo, 1601. 3. A book addressed to a certain king of Northumberland, named Alfrid, on various subjects. 4. *De vita monachorum*. 5. *De laude sanctorum*. 6. *De arithmetica*. 7. *De Astrologia*. 8. A book against the mistake of the Britons concerning the celebration of Easter; printed by Sonius, 1576. 9. *De laude Virginitatis*. Manuscript, in Bennet-college, Cambridge. Published among Bede's *Opuscula*. Besides many sonnets, epistles, and homilies in the Saxon language.

ALDPOR, an ancient name for Manchester. See MANCHESTER.

ALDRED, abbot of Tavistock, was promoted to the bishopric of Worcester in the year 1046. He was so much in favour with King Edward the Confessor, and had so much power over his mind, that he obliged him to be reconciled with the worst of his enemies, particularly with Swane son of the Earl Godwin, who had revolted against him, and came with an army to invade the kingdom. Aldred also restored the union and friendship between King Edward and Griffin king of Wales. He took afterwards a journey to Rome, and being returned into England, in the year 1054, he was sent ambassador to the emperor Henry II.; he staid a whole year in Germany, and was very honourably entertained by Herman archbishop of Cologne, from whom he learned many things relating to ecclesiastical discipline, which on his return he established in his own diocese. In the year 1058 he went to Jerusalem, which no archbishop or bishop of England had ever done before him. Two years after he returned to England; and Kinsius archbishop of York dying the 22d of December 1060, Aldred was elected in his stead on Christmas day following, and thought fit to keep his bishopric of Worcester with the archbishopric of Canterbury, as some of his predecessors had done. Aldred went soon after to Rome, in order to receive the Pallium from the Pope: He was attended by Toston, Earl of Northumberland, Giso bishop of Wells, and Walter bishop of Hereford. The pope received Toston

Aldhelm
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Aldred.

Aldred. ton very honourably, and made him sit by him in the synod which he held against the Simonists. He granted to Giso and Walter their request, because they were tolerably well learned, and not accused of simony. But Aldred being by his answers found ignorant, and guilty of simony, the pope deprived him very severely of all honours and dignities; so that he was obliged to return without the Pallium. On his way home he and his three fellow-travellers were attacked by some robbers, who took from them all that they had, though they did not offer to kill them. This obliged them to return to Rome; and the pope, either out of compassion, or by the threatenings of the Earl of Northumberland, gave Aldred the Pallium; but he was obliged to resign his bishopric of Worcester. However, as the archbishopric of York had been almost entirely ruined by the many invasions of foreigners, King Edward gave the new archbishop leave to keep twelve villages or manors which belonged to the bishopric of Worcester. Edward the Confessor dying in 1066, Aldred crowned Harald his successor. He also crowned William the Conqueror, after he had made him take the following oath, *viz.* that he would protect the holy churches of God and their leaders; that he would establish and observe righteous laws; that he would entirely prohibit and suppress all rapines and unjust judgments. He was so much in favour with the Conqueror, that this prince looked upon him as a father; and, though imperious in regard to every body else, he yet submitted to obey this archbishop: John Brompton gives us an instance of the king's submission, which at the same time shows the prelate's haughtiness.—It happened one day, as the archbishop was at York, that the deputy-governor or lord-lieutenant going out of the city with a great number of people, met the archbishop's servants, who came to town with several carts and horses loaded with provisions. The governor asked them to whom they belonged; and they having answered they were Aldred's servants, the governor ordered that all these provisions should be carried to the king's store-house. The archbishop sent immediately some of his clergy to the governor, commanding him to deliver the provisions, and to make satisfaction to St Peter, and to him the saint's vicar, for the injury he had done them; adding, that if he refused to comply, the archbishop would make use of his apostolic authority against him (intimating thereby that he would excommunicate him). The governor, offended at this proud message, used the persons whom the archbishop had sent him very ill, and returned an answer as haughty as the message was. Aldred thereupon went to London to make his complaint to the king; but in this very complaint he acted with his wonted insolence; for meeting the king in the church of St Peter at Westminster, he spoke to him in these words: "Hearken, O William: when thou wast but a foreigner, and God, to punish the sins of this nation, permitted thee to become master of it, after having shed a great deal of blood, I consecrated thee, and put the crown upon thy head with blessings; but now, because thou hast deserved it, I pronounce a curse over thee, instead of a blessing, since thou art become the persecutor of God's church, and of his ministers, and hast broken the promises and the oaths which thou
N^o 10.

"madest to me before St Peter's altar." The king, terrified at this discourse, fell upon his knees, and humbly begged the prelate to tell him, by what crime he had deserved so severe a sentence. The noblemen, who were present, were enraged against the archbishop, and loudly cried out he deserved death, or at least banishment, for having offered such an injury to his sovereign, and they pressed him with threatenings to raise the king from the ground. But the prelate, unmoved at all this, answered calmly, "Good men, let him lie there, for he is not at Aldred's but at St Peter's feet; he must feel St Peter's power, since he dared to injure his vice-gerent." Having thus reproved the nobles by his episcopal authority, he vouchsafed to take the king by the hand, and to tell him the ground of his complaint. The king humbly excused himself, by saying he had been ignorant of the whole matter; and begged of the noblemen to intreat the prelate that he might take off the curse he had pronounced, and to change it into a blessing. Aldred was at last prevailed upon to favour the king thus far; but not without the promise of several presents and favours, and only after the king had granted him to take such a revenge on the governor as he thought fit. Since that time (adds the historian) none of the noblemen ever dared to offer the least injury. It may be questioned which was more surprising here, whether the archbishop's haughtiness, who dared to treat his sovereign after so unbecoming a manner; or the king's stupidity, who suffered such insolence and audaciousness from a priest.—The Danes having made an invasion in the north of England in the year 1068, under the conduct of Harold and Canute the sons of king Swane, Aldred was so much afflicted at it, that he died of grief the 11th of September in that same year, having besought God that he might not see the desolation of his church and country.

ALDRICH (Robert), bishop of Carlisle, was born at Burnham in Buckinghamshire about the year 1493, and educated at Eaton school; from whence, in 1507, he was elected scholar of King's-college, Cambridge, where he took his degree in arts, and was afterwards proctor of the university. In 1525, he was appointed master of Eaton school, then became fellow of that college, and finally provost. In 1529, he went to Oxford, where, being first incorporated bachelor of divinity, in the following year he proceeded doctor in that faculty. In 1531, he was made archdeacon of Colchester; in 1534, canon of Windsor; and the same year, registry of the order of the garter. He was consecrated bishop of Carlisle in the year 1537, and died at Horncastle in Lincolnshire in 1556. He wrote, 1. *Epistola ad Gul. Hormanum*, in Latin verse; printed in Horman's *Antiboffican*, Lond. 1521, of which book Pitts erroneously makes Aldrich the author. 2. *Epigrammata varia*. 3. *Latin verses, and another epistle to Horman*, prefixed to the *Vulgaria puerorum* of that author, Lond. 1519, 4to. 4. *Answers to certain queries concerning the abuses of the mass; also about receiving the sacrament*.

ALDRICH (Dr Henry), an eminent English divine and philosopher, born at London in 1647, was educated at Westminster school under the famous Dr Busby, and admitted of Christ-church college, Oxford. He

Aldrich. He had a great share in the controversy with the Papists in the reign of James II. and bishop Burnet ranks him among those who examined all the points of popery with a solidity of judgment, clearness of argument, depth of learning, and vivacity of writing, far beyond any who had before that time written in our language. He rendered himself so conspicuous, that at the revolution, when Massey the popish dean of Christ church fled, his deanery was conferred on him. In this station he behaved in an exemplary manner, and that fabric owes much of its beauty to his ingenuity: it was Aldrich who designed the beautiful square called *Peckwater-Quadrangle*, which is esteemed an excellent piece of architecture. In imitation of his predecessor Dr Fell, he published, yearly, a piece of some ancient Greek author, as a present to the students of his house: he published *A System of Logic*, with some other pieces; and the revising Clarendon's History of the Rebellion was intrusted to him and bishop Spratt; but it doth not appear that they made any additions, or considerable alterations in it, as has been asserted by Mr Oldmixon. Besides his preferments above mentioned, Dr Aldrich was also rector of Wem in Shropshire. He was chosen prolocutor of the convocation in 1702. This worthy person died at Christ-church on the 14th of December 1710. As to his character, he was a most universal scholar, and had a taste for all sorts of learning, especially architecture. Sir John Hawkins has favoured the public with several particulars relative to Dr Aldrich's skill in music; and on account of the Doctor's eminence in this respect, Sir John hath given his life, with his head prefixed. His abilities as a musician rank him, we are told, among the greatest masters of the science. He composed many services for the church, which are well known; as are also his anthems, nearly to the number of twenty. He adapted, with great skill and judgment, English words to many of the notes of Palestrina, Carissimi, Victoria, and other Italian composers for the church, some of which are frequently sung in our cathedrals as anthems. By the happy talent which Dr Aldrich possessed, of naturalizing the compositions of the old Italian masters, and accommodating them to an English ear, he increased the stores of our own church. Though the Doctor chiefly applied himself to the cultivation of sacred music, yet, being a man of humour, he could divert himself by producing pieces of a lighter kind. There are two catches of his; the one, "Hark the bonny Christ-church Bells," the other intitled, "a Smoking Catch," to be sung by four men smoking their pipes, which is not more difficult to sing than diverting to hear. His love of smoking was, it seems, so excessive as to be an entertaining topic of discourse in the university. Such was Dr Aldrich's regard for the advancement of music, and the honour of its professors, that he had formed a design of writing a history of the science; and the materials from which he proposed to compile it are yet extant in the library of his own college. It appears from these materials, that he had marked down every thing which he had met with concerning music and musicians; but that he had wrought no part of them into any kind of form.

Dr Aldrich is of some note as a Latin poet. In the *Muse Angelicæ*, we find two elegant copies of verses by him; one on the accession of King William III.

VOL. I. Part I.

and the other on the death of the Duke of Gloucester. Sir John Hawkins hath preserved a humorous translation by him of the well-known English ballad,

Aldrich,
Aldrovandus.

"A soldier and a sailor,
"A tinker and a taylor," &c.

The following epigram, intitled "Causa Bibendi," is likewise ascribed to Dr Aldrich:

"Si bene quid memini, Causæ sunt quinque bibendi,
"Hospitis Adventus; præsens Sitis, atque futura;
"Aut Vini Bonitas; aut quæ libet altera Causa."

The epigram has been thus translated:

"If on my theme I rightly think,
"There are five reasons why men drink:
"Good wine, a friend, because I'm dry,
"Or lest I should be by and bye,
"Or any other reason why."

The translation is not equal to the original. It is evident, from the verses cited and referred to, that Dr Aldrich was of a very cheerful and pleasant turn of mind. Indeed, he is always spoken of as having been a man of wit; and as one who, to his great talents and virtues, joined those amiable qualities, which rendered him the object of general affection, as well as of general esteem and respect. Having never been married, he appropriated his income to works of hospitality and beneficence, and in encouraging learning to the utmost of his power, of which he was a most munificent patron, as well as one of the greatest men in England, if considered as a Christian or a gentleman. He had always the interest of his college at heart, whereof he was an excellent governor. And, as he was remarkable for modesty and humility, concealing his name to those several learned tracts he published, so at his death he appointed to be buried without any memorial in the cathedral; which his thrifty nephew complied with, depositing him on the south side of bishop Fell's grave, December 22, eight days after his decease; which happened in the 63d or 64th year of his age.

ALDROVANDUS (Ulysses), professor of philosophy and physic at Bologna, the place of his nativity. He was a most curious inquirer into natural history, and travelled into the most distant countries on purpose to inform himself of their natural productions. Minerals, metals, plants, and animals, were the objects of his curious researches; but he applied himself chiefly to birds, and was at great expence to have figures of them drawn from the life. Aubert le Mire says, that he gave a certain painter, famous in that art, a yearly salary of 200 crowns, for 30 years and upwards; and that he employed at his own expence Lorenzo Bennini and Cornelius Swintus, as well as the famous engraver Christopher Coriolanus. These expences ruined his fortune, and at length reduced him to the utmost necessity; and it is said that he died blind in an hospital at Bologna, at a great age, in 1605. Mr Bayle observes, that antiquity does not furnish us with an instance of a design so extensive and so laborious as that of Aldrovandus, with regard to natural history; that Pliny has treated of more kinds of subjects, but only touches lightly on them, saying but a little upon any thing, whereas Aldrovandus has collected all he could meet with. His compilation, or that compiled upon

Aldrovandus
da
Ale.

his plan, consists of 13 volumes in folio, several of which were printed after his death. He himself published his Ornithology, or History of Birds, in three folio volumes, in 1599; and his seven books of Insects, which make another volume of the same size. The volume Of Serpents, three Of Quadrupeds, one Of Fishes, that Of exanguious Animals, the History of Monsters, with the Supplement to that of Animals, the treatise Of Metals, and the Dendrology or History of Trees, were published at several times after the death of Aldrovandus, by the care of different persons; and Aldrovandus is the sole author only of the first six volumes of this work, the rest having been finished and compiled by others, upon the plan of Aldrovandus: a most extensive plan, wherein he not only relates what he has read in naturalists, but remarks also what historians have written, legislators ordained, and poets feigned: he explains also the different uses which may be made of the things he treats of, in common life, in medicine, architecture, and other arts; in short, he speaks of morality, proverbs, devices, riddles, hieroglyphics, and many other things which relate to his subject.

ALDROVANDA, in botany, a genus of the pentandria order, belonging to the pentagynia class of plants; of which there is but one species. The calyx is divided into five parts; the petals are five; and the capsule has five valves, with ten seeds. It is a native of Italy and the Indies; and has no English name.

ALDUABIS (anc. geog.), a river of Celtic Gaul, which rising from Mount Jura, separating the Sequani from the Helvetii, and running through the county of Burgundy, or the Franche Comté, environs almost on every side the city of Besançon; and running by Dole, falls into the Saone near Chalon. In Cæsar it is called *Alduasdubis*; in Ptolemy, *Dubis*: now *le Doux*.

ALE, a fermented liquor obtained from an infusion of malt, and differing from beer chiefly in having a less proportion of hops. (See BREWING.) This liquor, the natural substitute of wine in such countries as could not produce the grape, was originally made in Egypt, the first planted kingdom, on the dispersion from the east, that was supposed unable to produce grapes. And, as the Noachian colonies pierced further into the west, they found, or thought they found, the same defect, and supplied it in the same manner. Thus the natives of Spain, the inhabitants of France, and the aborigines of Britain, all used an infusion of barley for their ordinary liquor: and it was called by the various names of *Cælia* and *Ceria* in the first country, *Cerevisia* in the second, and *Curmi* in the last; all literally importing only *the strong water*.

"All the several nations (says Pliny) who inhabit the west of Europe, have a liquor with which they intoxicate themselves, made of corn and water. The manner of making this liquor is somewhat different in Gaul, Spain, and other countries, and is called by many various names; but its nature and properties are every where the same. The people of Spain, in particular, brew this liquor so well, that it will keep good a long time. So exquisite is the cunning of mankind, in gratifying their vicious appetites, that they have thus invented a method to make water itself intoxicating." The method in which the ancient Britons, and other Celtic nations, made their ale, is thus described by Isidorus and Orosius. "The grain is steeped in

water and made to germinate, by which its spirits are excited and set at liberty; it is then dried and ground; after which it is infused in a certain quantity of water; which being fermented, becomes a pleasant, warming, strengthening, and intoxicating liquor." This ale was most commonly made of barley; but sometimes of wheat, oats, and millet.

Anciently the Welch and Scots had also two kinds of ale, called *common ale* and *spiced ale*; and their value was thus ascertained by law: "If a farmer hath no mead, he shall pay two casks of spiced ale, or four casks of common ale, for one cask of mead." By this law, a cask of spiced ale, nine palms in height, and 18 palms in diameter, was valued at a sum of money equal in efficacy to L.7: 10s. of our present money; and a cask of common ale, of the same dimensions, at a sum equal to L.3: 15s. This is a sufficient proof, that even common ale in this period was an article of luxury among the Welch, which could only be obtained by the great and opulent. Wine seems to have been quite unknown even to the kings of Wales, in this period, as it is not so much as once mentioned in their laws; though Giraldus Cambrensis, who flourished about a century after the conquest, acquaints us, that there was a vineyard in his time at Maenarper, near Pembroke, in South Wales.

Ale was the favourite liquor of the Anglo-Saxons and Danes, as it had been of their ancestors the ancient Germans. Before their conversion to Christianity, they believed that drinking large and frequent draughts of ale was one of the chief felicities which those heroes enjoyed who were admitted into the hall of Odin.

There are various sorts of ale known in Britain, particularly *pale* and *brown*: the former is brewed from malt slightly dried; and is esteemed more viscid than the latter, which is made from malt more highly dried or roasted.

Pale ale brewed with hard waters, as those of springs and wells, is judged the most wholesome, in regard the mineral particles tend to prevent the cohesions of those drawn from the grain, and enable them to pass the proper secretions the better; softer waters, as those of rivers, and rain, seem better suited to draw out the substance of high-dried malts, which retain many igneous particles, best absorbed in a smooth vehicle.

In Staffordshire, they have a secret of fining ale in a very short time. Plot conjectures it to be done by adding alum, or vinegar, in the working.

Ale is prepared various ways, and of various ingredients, as of wheat, rye, millet, oats, barley, the berries of the quick-bean, &c.

Some have found that the juice which bleeds from the birch or fycamore is of great use on this occasion, applied instead of water. It makes one bushel of malt go as far as four in the common way.

Some have a method of preparing ale, so that it will keep, carried to the East or West Indies. The secret is, by mashing twice with fresh malt; boiling twice; and, after shipping it, putting to every five gallons two new-laid eggs whole, to remain therein. It is said, that, in a fortnight's time, the shells will be dissolved; and the eggs become like wind-eggs; and that afterwards the white would disappear and the yoke remain untouched.

Ale.

Ale is generally held to be more diuretic than beer, in regard it is smoother, more softening, and relaxing; so that where urine is to be promoted by facilitating the passage, ale is most likely to effect it.

Ale is flatulent; and hence sometimes produces colics, and the cholera morbus: it is acedent; but it does not produce calcareous diseases, as has been asserted.

If malt-liquor, of any degree of strength, is become flat and tartish, as it is used, it should be drawn out of the cask into a jug, in which as many drams of powdered chalk is put as there are to be pints of liquor; thus a new ferment will be raised, a sprightly taste will be restored to the liquor, and its acidity will be destroyed. Tart liquors of this kind are apt to produce a dysury, strangury, or a gonorrhœa; in which cases, a small quantity of brandy may be taken.

The consumption of ale in these kingdoms is incredible. It was computed twenty years ago at the value of four millions yearly, including Great Britain and Ireland.

The duties on ale and beer make a principal branch of the revenue in Britain. They were first imposed by the 12th of Car. II. and have been continued by several subsequent acts of parliament to first Geo. III. which lays an additional duty of 3d. per barrel. In the whole, the brewer of ale and beer for sale shall pay 8s. for every barrel of either, above 6s. a barrel; and for every barrel of 6s. or under, the sum of 1s. 4d.

Medicated ALES, those wherein medicinal herbs have been infused, or added during the fermentation. See PHARMACY, (Index).

Gill ALE, is that in which the dried leaves of gill or ground-ivy have been infused. It is esteemed absterfive and vulnerary, and consequently good in disorders of the breast and obstructions of the viscera.

ALE-Comer, an officer in London, who inspects the measures used in public-houses. There are four ale-conners, who are all chosen by the liverymen in common-hall on Midsummer-day.

ALE-Houses must be licensed by justices of the peace, who take recognizances of the persons licensed, and of their sureties, viz. 10 l. each, that they will not suffer unlawful gaming, nor other disorderly practices in their houses. Every person, excepting those who sell ale in fairs, neglecting to procure a licence, is liable to a penalty of 40s. for the first offence, 4 l. for the second, and 6 l. for the third, with all costs. The licence is granted on the first of September, or within twenty days after, at a general meeting of the justices for the division to which he belongs, upon his producing a certificate to his character, unless, by living in a city or town-corporate, this last circumstance is dispensed with, and continues in force for one year only. Ale-house keepers, selling ale in short measure, are liable to a penalty not exceeding 40s. and not less than 10s. and likewise to a fine of 10s. for permitting tipling, &c.

By 29th Geo. II. c. 12. persons keeping ale-houses in Scotland shall be licensed as in England, and the justices there shall meet annually to license ale-houses; on each of which licenses a fee of 1s. is payable to the clerk of the peace. Magistrates of royal boroughs shall meet yearly for the like purpose; but where there shall not be a sufficient number of magistrates to act in any royal borough, justices may grant licenses, to be in force for one year only. Ibid.

Persons in Scotland convicted of keeping unlicensed ale-houses shall forfeit for the first offence 5s. for the second 10s. for the third 20s. and to be disqualified; and for every subsequent offence 40s. to be levied by distress and sale, one moiety to the informer, the other to the poor of the parish. Conviction to be intimated to the offender, and certified to the clerk of the peace, and recorded: but persons aggrieved may appeal to the quarter sessions. Ibid.

Licenses for houses on the military roads in Scotland shall be issued on payment of 1s. only to the clerk of the peace: making out licenses before the same be stamped, is a penalty of 10 l. and making them contrary to the intention of this act, 5 l. and the same shall be vacated, unless the duty and fine be paid, and the receipt produced, and license stamped. Ibid.

ALE-Silver, a tax paid annually to the lord-mayor of London, by all who sell ale within the city.

ALEA, in Roman antiquity, denotes in general all manner of games of chance; but, in a more restricted sense, was used for a particular game played with dice and tables, not unlike our backgammon.

ALEANDER (Jerome), cardinal and archbishop of Brindisi, was born in 1480; and distinguished himself at the beginning of the reformation, by the opposition he made to Luther: for being sent into Germany as the pope's nuncio in 1519, he acted, as occasion served, in the character both of ambassador and doctor; and declaimed three hours together against Luther's doctrine before the diet of Worms, but could not prevent that celebrated reformer from being heard in that diet. He published several works, and died at Rome in 1542.

ALEANDER (Jerome), a learned man of the seventeenth century, born in the principality of Friuli, of the same family with the preceding. When he went to Rome, he was employed as secretary under cardinal Octavius Bandini, and discharged this office with great honour for almost twenty years. He afterwards, by the persuasion of Urban VIII. who had a great esteem for him, became secretary to Cardinal Barberini, whom he accompanied to Rome when he went there in the character of legate à latere, and in whose service he died in 1631. He was one of the first members of the academy of Humorists, wrote a learned treatise in Italian on the device of the society, and displayed his genius on many different subjects. Barberini gave him a magnificent funeral at the academy of Humorists; the academists carried his corpse to the grave; and Gaspar Simeonibus, one of the members, made his funeral oration.

ALECTO, one of the FURIES, daughter of Acheron and Night, or, as others would have it, of Pluto and Proserpine.

ALECTORIA, a stone said to be formed in the gall-bladders of old cocks, to which the ancients ascribed many fabulous virtues. This is otherwise called *Alectorius Lapis*, sometimes *Alectorolithos*, in English the *cock-stone*. The more modern naturalists hold the *alectorius lapis* to be originally swallowed down, not generated in, the stomach or gizzard of cocks and capons. It is known that many of the fowl-kind make a practice of swallowing pebbles, as it is supposed to be of service in the business of trituration and digestion.

ALECTOROMANTIA, in antiquity, a species of divination performed by means of a cock. This is

Ale
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Alectoro-
mantia.

A-lee
||
Alembert.

otherwise called *Alectryomancy*; of which there appear to have been different species. But that most spoken of by authors was in the following manner: A circle being described on the ground, and divided into twenty-four equal portions, in each of these spaces was written one of the letters of the alphabet, and on each of the letters was laid a grain of wheat; after which, a cock being turned loose in the circle, particular notice was taken of the grains picked up by the cock, because the letters under them, being formed into a word, made the answer desired. It was thus, according to Zonaras, that Libanius and Jamblicus sought who should succeed the emperor Valens; and the cock eating the grains answering to the spaces ΘΕΟΔ, several whose names began with those letters, as Theodotus, Theodistes, Theodulus, &c. were put to death; which did not hinder, but promote, Theodosius to the succession. But the story, however current, is but ill supported: It has been called in question by some, and refuted by others, from the silence of Marcellinus, Socrates, and other historians of that time.

A-LEE, in the sea-language, a term only used when the wind, crossing or flanking the line of a ship's course, presses upon the masts and sails so as to make her incline to one side, which is called the lee-side: hence, when the helm is moved over to this side, it is said to be *a-lee*, or *hard-a-lee*.

ALEGAMBE (Philip), a celebrated Jesuit, born at Brussels in 1592, distinguished himself by publishing a *Bibliothèque* of the writers of his order, and died at Rome in 1652.

ALEGRETTE, a small town of Portugal, in Alentejo, on the confines of Port Alegre, on the river Caja, which falls into the Guadiana, a little below Bajadoz, near the frontiers of Spanish Estremadura. It is a very pretty town, and finely situated; seven miles south-east of Port Alegre, and thirty north of Elvas. W. Long. 5. 20. N. Lat. 39. 6.

ALEIUS CAMPUS (anc. geog.), a plain in Cilicia, on this side the river Pyramus, near the mountain Chimera, famous for Bellerophon's wandering and perishing there, after being thrown off Pegasus; which is the reason of the appellation.

ALEMANIA, or ALLEMANIA, (anc. geog.) a name of Germany, but not known before the time of the Antonines, and then used only for a part. After the Marcomanni and their allies had removed from the Rhine, a rabble, or collection of people from all parts of Gaul, as the term *Alemanni* denotes, prompted either by levity or poverty, occupied the Agri, called *Decumates* by Tacitus, because they held them on a tithe; now supposed to be the duchy of *Wurtemberg*. Such appear to be the small beginnings of Alemania, which was in after-times greatly enlarged: but still it was considered as a distinct part; for Caracalla, who conquered the Alemanni, assumed the surname both of *Alemannicus* and *Germanicus*.

ALEMBDAR, an officer in the court of the Grand Signior, who bears the green standard of Mahomet, when the sultan appears in public on any solemn occasion.

ALEMBERT (John le Rond d'), an eminent French Philosopher, was born at Paris in 1717. He derived the name of John le Rond from that of the church near which, after his birth, he was exposed as

a foundling. His father, informed of this circumstance, listened to the voice of nature and duty, took measures for the proper education of his child, and for his future subsistence in a state of ease and independence.

He received his first education in the College of the Four Nations, among the Jansenists, where he gave early marks of capacity and genius. In the first year of his philosophical studies, he composed a Commentary on the Epistle of St Paul to the Romans. The Jansenists considered this production as an omen that portended to the party of Port-Royal a restoration to some part of their ancient splendor, and hoped to find one day in M. d'Alembert a second Pascal. To render this resemblance more complete, they engaged their rising pupil in the study of the mathematics; but they soon perceived that his growing attachment to this science was likely to disappoint the hopes they had formed with respect to his future destination: they, therefore, endeavoured to divert him from this line; but their endeavours were fruitless.

At his leaving college, he found himself alone and unconnected in the world; and sought an asylum in the house of his nurse. He comforted himself with the hope, that his fortune, though not ample, would better the condition and subsistence of that family, which was the only one that he could consider as his own: Here, therefore, he took up his residence, resolving to apply himself entirely to the study of geometry: And here he lived, during the space of forty years, with the greatest simplicity, discovering the augmentation of his means only by increasing displays of his beneficence, concealing his growing reputation and celebrity from these honest people, and making their plain and uncouth manners the subject of good natured pleasantry and philosophical observation. His good nurse perceived his ardent activity; heard him mentioned as the writer of many books; but never took it into her head that he was a great man, and rather beheld him with a kind of compassion. "You will never," said she to him one day, "be any thing but a philosopher—and what is a philosopher?—a fool, who toils and plagues himself during his life, that people may talk of him when he is no more."

As M. d'Alembert's fortune did not far exceed the demands of necessity, his friends advised him to think of a profession that might enable him to augment it. He accordingly turned his views to the law, and took his degrees in that line; but soon abandoned this plan, and applied to the study of medicine. Geometry, however, was always drawing him back to his former pursuits, and after many ineffectual efforts to resist its attractions, he renounced all views of a lucrative profession, and gave himself over entirely to mathematics and poverty.

In the year 1741 he was admitted member of the Academy of Sciences; for which distinguished literary promotion, at such an early age, he had prepared the way by correcting the errors of a celebrated work*, which was deemed *classical* in France in the line of geometry. He afterwards set himself to examine, with deep attention and assiduity, what must be the motion of a body which passes from one fluid into another more dense, in a direction not perpendicular to the surface separating the two fluids. Every one knows the phenomenon which happens in this case, and which amuses

* The *Analyses* of the *l'usage de la démonstration* of F. Beinau.

Alembert. amuses children under the denomination of *Ducks and Drakes*; but M. d'Alembert was the first who explained it in a satisfactory and philosophical manner.

Two years after his election to a place in the academy, he published his *Treatise on Dynamics*. The new principle developed in this treatise consisted in establishing equality, at each instant, between the changes that the motion of a body has undergone, and the forces or powers which have been employed to produce them; or to express the thing otherwise, in separating into *two parts* the action of the moving powers, and considering the *one* as producing alone the motion of the body, in the second instant, and the *other* as employed to destroy that which it had in the first.

So early as the year 1744, M. d'Alembert had applied this principle to the theory of the equilibrium, and the motion of fluids; and all the problems before solved by geometers became, in some measure, its corollaries. The discovery of this new principal was followed by that of a new calculus, the first trials of which were published in a *Discourse on the general Theory of the Winds*, to which the prize-medal was adjudged by the academy of Berlin in the year 1746, and which was a new and brilliant addition to the fame of M. d'Alembert. This new calculus of partial differences he applied, the year following, to the problem of vibrating chords, whose solution, as well as the theory of the oscillations of the air and the propagation of sound, had been given but incompletely by the geometers who preceded him, and these were his masters or his rivals.

In the year 1749 he furnished a method of applying his principle to the motion of any body of a given figure; and he solved the problem of the procession of the equinoxes, determined its *quantity*, and explained the phenomenon of the nutation of the terrestrial axis discovered by Dr Bradley.

In 1752, M. d'Alembert published a treatise on the *Resistance of Fluids*, to which he gave the modest title of an *Essay*; but which contains a multitude of original ideas and new observations. About the same time he published, in the Memoirs of the Academy of Berlin, *Researches concerning the Integral Calculus*, which is greatly indebted to him for the rapid progress it has made in the present century.

While the studies of M. d'Alembert were confined to geometry, he was little known or celebrated in his native country. His connections were limited to a small society of select friends: he had never seen any man in high office except Messrs d'Argenson. Satisfied with an income which furnished him with the necessities of life, he did not aspire after opulence or honours, nor had they been hitherto bestowed upon him, as it is easier to confer them on those who solicit them, than to look out for men who deserve them. His cheerful conversation, his smart and lively sallies, a happy knack at telling a story, a singular mixture of malice of speech with goodness of heart, and of delicacy of wit with simplicity of manners, rendered him a pleasing and interesting companion, and his company consequently was much sought after in the fashionable circles. His reputation, at length, made its way to the throne, and rendered him the object of royal attention and beneficence. He received also a pension from go-

vernment, which he owed to the friendship of Count Alembert. d'Argenson.

The tranquillity of M. d'Alembert was abated when his fame grew more extensive, and when it was known beyond the circle of his friends, that a fine and enlightened taste for literature and philosophy accompanied his mathematical genius. Our author's eulogist ascribes to envy, detraction, and to other motives nearly as ungenerous, all the disapprobation, opposition, and censure that M. d'Alembert met with on account of the publication of the famous Encyclopedical Dictionary of Arts and Sciences, in conjunction with Diderot. None surely will refuse the well-deserved tribute of applause to the eminent displays of genius, judgment, and true literary taste, with which M. d'Alembert has enriched the great work now mentioned. Among others, the Preliminary Discourse he has affixed to it, concerning the rise, progress, connections, and affinities of all the branches of human knowledge, is perhaps one of the most capital productions of which the philosophy of the present age can boast. Nor will it be disputed, that the master-builders of this new and stupendous temple of science, for the worship of NATURE, had also really in view the advancement of human knowledge, and the improvement of the arts and sciences. This, no true, no candid philosopher, will call in question. But that in the *inner court* of this temple there was a confederacy formed against all those who looked higher than nature, for the principal object of their veneration and confidence, is a fact too palpable, nay too boldly avowed, to stand in need of any proof.

Some time after this, d'Alembert published his Philosophical, Historical, and Philological Miscellanies. These were followed by the Memoirs of Christina Queen of Sweden; in which M. d'Alembert showed that he was acquainted with the natural rights of mankind, and was bold enough to assert them. His *Essay on the Intercourse of Men of Letters with Persons high in Rank and Office*, wounded the former to the quick, as it exposed to the eyes of the public the ignominy of those servile chains, which they feared to shake off, or were proud to wear. A lady of the court hearing one day the author accused of having exaggerated the despotism of the great, and the submission they require, answered slyly, *If he had consulted me, I would have told him still more of the matter.*

M. d'Alembert gave very elegant specimens of his literary abilities in his translations of some select pieces of Tacitus. But these occupations did not divert him from his mathematical studies: for about the same time he enriched the Encyclopédie with a multitude of excellent articles in that line, and composed his *Researches on several important Points of the System of the World*, in which he carried to a higher degree of perfection the solution of the problem of the perturbations of the planets, that had several years before been presented to the Academy.

In 1759 he published his *Elements of Philosophy*: a work extolled as remarkable for its precision and perspicuity; in which, however, are some tenets relative both to metaphysics and moral science, that are far from being admissible.

The resentment that was kindled (and the disputes that followed it) by the article *Geneva*, inserted in the Encyclopédie,

Monthly
Review for
Mar. 1787.

Alembert *Encyclopédie*, are well known. M. d'Alembert did not leave this field of controversy with flying colours. **Alembroth.** Voltaire was an auxiliary in the contest: but as, in point of candour and decency, he had no reputation to lose; and as he weakened the blows of his enemies, by throwing both them and the spectators into fits of laughter, the issue of the war gave him little uneasiness. It fell more heavily on d'Alembert; and exposed him, even at home, to much contradiction and opposition.

It was on this occasion that the late king of Prussia offered him an honourable asylum at his court, and the place of president of his academy; and was not offended at his refusal of these distinctions, but cultivated an intimate friendship with him during the rest of his life. He had refused, some time before this, a proposal made by the empress of Russia to intrust him with the education of the Grand Duke;—a proposal accompanied with all the flattering offers that could tempt a man ambitious of titles, or desirous of making an ample fortune: but the objects of his ambition were tranquillity and study.

In the year 1765, he published his *Dissertation on the Destruction of the Jesuits*. This piece drew upon him a swarm of adversaries, who confirmed the merit and credit of his work by their manner of attacking it.

Beside the works already mentioned, he published nine volumes of memoirs and treatises, under the title of *Opuscules*; in which he has solved a multitude of problems relative to astronomy, mathematics, and natural philosophy; of which our panegyrist gives a particular account, more especially of those which exhibit new subjects, or new methods of investigation.

He published also *Elements of Music*; and rendered, at length, the system of Reauman intelligible; but he did not think the mathematical theory of the sonorous body sufficient to account for the rules of that art. He was always fond of music; which, on the one hand, is connected with the most subtle and learned researches of rational mechanics; while, on the other, its power over the senses and the soul exhibits to philosophers phenomena no less singular, and still more inexplicable.

In the year 1772, he was chosen secretary to the French academy. He formed, soon after this preferment, the design of writing the lives of all the deceased academicians from 1700 to 1772; and in the space of three years he executed this design, by composing 70 eulogies.

M. d'Alembert died on the 29th of October 1783. There were many amiable lines of candour, modesty, disinterestedness, and beneficence, in his moral character; which are described, with a diffusive detail, in his eulogium, by M. Condorcet, *Hist. de l'Acad. Royale des Sciences*, 1783.

ALEMBIC, a chemical vessel, usually made of glass or copper, formerly used for distillation. The bottom part, which contained the subject for distillation, is called, from its shape, the *cucurbit*; the upper part, which receives and condenses the steam, is called the *head*, the beak of which is fitted into the neck of a receiver. Retorts, and the common *worm-still*, are now more generally employed.

ALEMBROTH, in the writings of the alchemists,

a word used for a sort of fixed alkaline salt, which had the power of the famous alkahest, in dissolving bodies, opening the pores of most or all known substances, and thence, as well as by destroying sulphurs, promoting the separation of metals from their ores.—It is also used for a compound of corrosive mercury and sal ammoniac. See **CHEMISTRY**.

ALENIO (Julius), a Jesuit, born at Brescia in the republic of Venice. He travelled into the eastern countries; and arrived at Maca in 1610, where he taught mathematics. From thence he went to the empire of China, where he continued to propagate the Christian religion for thirty-six years. He was the first who planted the faith in the province of Xansi, and he built several churches in the province of Fokien. He died in August 1649, leaving behind him several works in the Chinese language.

ALENTEJO, a province of Portugal, between the rivers of Tajo and Guadiana: the soil is very fertile, and the inhabitants laborious and industrious. The principal town is Eborá.

ALENZON, a large handsome town of France, in Lower Normandy, with the title of a duchy. It is surrounded with good walls, and flanked with towers. The castle was formerly a place of great consequence, and has held out long sieges. It has but one parish-church, which has a bold and noble front. Among the nunneries, that of St Clair is most remarkable. It is seated on the river Sarte, in a vast open plain, which produces all sorts of corn and fruit. Near it there are quarries of stone fit for building, wherein are found a sort-like Bristol stones. The linen made at Alenzon is very good, and sells at Paris. It is 20 miles north of Mans, 63 south-by-west of Rouen, and 88 south-west of Paris. Lon. O. 10. N. Lat. 48. 25.

ALEPPO, or **HALAB**, the capital of the Pachalic, and of all Syria, and the ordinary residence of the pacha, is situated in the vast plain which extends from the Orontes to the Euphrates, and which towards the south terminates in the desert. It is built on eight hills or eminences, on the highest of which the castle is erected, and is supposed to be the ancient Beræa. This mount is of a conic form, and seems in a great measure to be raised with the earth thrown up out of a deep broad ditch which surrounds it. The suburbs to the north-north-east are next in height to this, and those to the west-south-west are much lower than the parts adjacent, and than any other part of the city. The houses are large and commodious, having terraces on their tops, and generally sky-lights in form of a dome to let the light into the rooms, which from their loftiness, the gilding on the window-shutters, cupboard-doors, &c. have at first entrance a very grand and agreeable effect. They are all so equal in height, that there are seldom any steps to ascend or descend in going from one house to another; while several large vaulted streets increase the facility of communication, by affording a passage to every part of the city free from the embarrassment of the open streets. They are carefully paved; have gutters and a foot-pavement on each side; and the middle of the street is laid with brick, the small end upwards, for the convenience of the horses. There is also a cleanliness observed here unknown to the other cities of Turkey, and which is not attended with the trouble of our scavengers, there being

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Aleppo. being ass-drivers who go about the city and take up the rubbish and dust, which each inhabitant is obliged to sweep together; and though the heat of the climate renders this labour more easy, the same heat obliges them to greater cleanliness in order to preserve the salubrity of the air.

The mosques in Aleppo are numerous, and some few of them magnificent. Before each of them is an area, with a fountain in the middle, designed for ablutions before prayers; and behind some of the larger there are little gardens. There are many large khans, or caravanseras, consisting of a capacious square, on all sides of which are a number of rooms, built on a ground-floor, used occasionally for chambers, ware-houses, or stables. Above stairs there is a colonade or gallery on every side, in which are the doors of a number of small rooms, wherein the merchants, as well strangers as natives, transact most of their business.

The bazars or market-places are long covered narrow streets, on each side of which are a great number of small shops, just sufficient to hold the tradesman and his goods, the buyer being obliged to stand without. Each separate branch of business has a particular bazar, which is locked up, as well as the streets, an hour and a half after sun-set: but the locks are of wood, though the doors are cased with iron. The slaughter-houses are in the suburbs, open to the fields. The tanners have a khan to work in near the river. To the southward in the suburbs they burn lime; and a little beyond that there is a village where they make ropes and catgut. On the opposite side of the river, to the westward, there is a glass-house, where they make a coarse white glass, in the winter only; for the greatest part of this manufacture is brought from a village 35 miles westward.

The situation of Aleppo, beside the advantage of a rich and fruitful soil, possesses also that of a stream of fresh water, which never becomes dry. This rivulet, which is about as large as that of the Gobelins at Paris, or the New River near London, rises in the mountains of Aentab, and terminates six leagues below Aleppo, in a morass full of wild boars and pelicans. Near Aleppo, its banks, instead of the naked rocks which line them in the upper part of its course, are covered with a fertile earth, and laid out in gardens, or rather orchards, which, in a hot country, and especially in Turkey, cannot but be delightful. The city is in itself one of the most agreeable in Syria, and is perhaps the cleanest and best built of any in Turkey. On whatever side it is approached, its numerous minarets and domes present an agreeable prospect to the eye, fatigued with the continued sameness of the brown and parched plains. In the centre is an artificial mountain surrounded by a dry ditch, on which is a ruinous fortress. From hence we have a fine prospect of the whole city, and to the north discover the snowy tops of the mountains of Bailan; and on the west, those which separate the Orontes from the sea; while to the south and east, the eye can discern as far as the Euphrates. In the time of Omar, this castle stopped the progress of the Arabs for several months, and was at last taken by treachery, but at present would not be able to resist the feeblest assault. Its slight wall, low, and without a buttress, is in ruins; its little old towers are in no better condition; and it has not four can-

non fit for service, not excepting a culverine nine feet long, taken from the Persians at the siege of Bassora. Three hundred and fifty Janisaries, who should form the garrison, are busy in their shops, and the aga scarcely finds room in it to lodge his retinue. It is remarkable that this aga is named immediately by the Porte, which, ever suspicious, divides as much as possible the different offices. Within the walls of the castle is a well, which, by means of a subterraneous communication, derives its water from a spring a league and a quarter distant. In the environs of the city, we find a number of large square stones, on the top of which is a turban of stone, which are so many tombs. There are many rising grounds round it, which, in case of a siege, would greatly facilitate the approaches of the assailants. Such, among others, is that on which the house of the Derviches stands, and which commands the canal and the rivulet: Aleppo, therefore, cannot be esteemed a place of importance in war, though it be the key of Syria to the north; but, considered as a commercial city, it has a different appearance. It is the emporium of Armenia and the Diarbekar; sends caravans to Bagdad and into Persia; and communicates with the Persian Gulph and India, by Bassora, with Egypt and Mecca by Damascus, and with Europe by Skanderoon (Alexandretta) and Latakia. Commerce is there principally carried on by barter. The chief commodities are raw or spun cottons, clumsy linens fabricated in the villages; silk stuffs manufactured in the city, copper, *bourres* (coarse cloths) like those of Rouen, goats hair brought from Natolia; the gall nuts of the Kourdestan, the merchandise of India, such as shawls and muslins, and pistachio nuts of the growth of the neighbourhood. The articles supplied by Europe are the Languedoc cloths, cochineal, indigo, sugar, and some other groceries. The coffee of America, though prohibited, is introduced, and serves to mix with that of Moka. The French have at Aleppo a consul and seven counting-houses; the English and the Venetians two, and the merchants of Leghorn and Holland one. The emperor appointed a consul there in 1784, in the person of a rich Jew merchant, who shaved his beard to assume the uniform and the sword. Russia has also sent one very lately. Aleppo is not exceeded in extent by any city in Turkey, except Constantinople and Cairo, and perhaps Smyrna. The number of inhabitants has been computed at 200,000; but in these calculations certainty is impossible. However, if we observe that this city is not larger than Nantes or Marseilles, and that the houses consist only of one story, we shall perhaps not think it probable they exceed 100,000. The people of this city, both Turks and Christians, are with reason esteemed the most civilized in all Turkey; and the European merchants no where enjoy so much liberty, or are treated with so much respect.

The air of Aleppo is very dry and piercing, but at the same time very salubrious for all who are not troubled with asthmatic complaints. The city, however, and the environs, are subject to a singular endemial disorder, which is called the ringworm or pimple of Aleppo; it is in fact a pimple which is at first inflammatory, and at length becomes an ulcer of the size of the nail. The usual duration of this ulcer is one year; it

Aleppo. it commonly fixes on the face, and leaves a scar which disfigures almost all the inhabitants. It is alleged that every stranger who resides there three months is attacked with it; experience has taught that the best mode of treatment is to make use of no remedy. No reason is assigned for this malady: but M. Volney suspects it proceeds from the quality of the water, as it is likewise frequent in the neighbouring villages, in some parts of the Diarbekar, and even in certain districts near Damascus, where the soil and the water have the same appearances. Of the Christian inhabitants the greater number are Greeks, next to them the Armenians, then the Syrians, and lastly the Maronites; each of whom have a church in the city called *Judida*; in which quarter, and the parts adjacent, most of them reside. The common language is the vulgar Arabic, but the Turks of condition use the Turkish. Most of the Armenians can speak the Armenian, some few Syrians understand Syriac, and many of the Jews Hebrew; but scarce one of the Greeks understand a word of Greek. The people in general are of a middle stature, and tolerably well proportioned; but they seem neither vigorous nor active. Both sexes are handsome when young: but the beard soon disfigures the men: and the women, as they come early to maturity, also fade very soon; females are generally married from 14 to 18 years of age, and many under 14. The people of rank here are polite and affable, making allowances for that superiority which the Mahometan religion instructs its votaries to assume over all who hold a different faith. Their bread is generally of wheat flour made into thin cakes, but very ill prepared, and is generally eaten as soon as it comes out of the oven. The principal people have small loaves of a finer flour, which are well fermented and baked. Besides these, there are a variety of biscuits, most of which are strewed on the top with some kind of seeds. The Europeans have very good bread, baked and prepared in the French manner. All the inhabitants of both sexes smoke tobacco to great excess; even the very servants have almost constantly a pipe in their mouths. Coaches or carriages are not used here; therefore persons of quality ride on horseback in the city, with a number of servants walking before them, according to their rank: ladies of the first distinction are even compelled to walk on foot in the city, or to any place at a moderate distance; in longer journeys they are carried by mules, in a kind of a couch close covered up. There are a number of public bagnios in this city, which are used by people of all ranks, except those of the highest distinction, who commonly have baths and every other convenience in their own houses. Aleppo is 70 miles east of Scandaroon, on the sea-coast, and 175 north-by-east of Damascus. E. Long. 37. 40. N. Lat. 36. 12.

Aleppo (the Pachalic of), one of the five governments into which Syria is divided. It comprehends the country extending from the Euphrates to the Mediterranean, between two lines, one drawn from Scandaroon to Beer, along the mountains; the other from Beles to the sea, by Mara and the bridge of Shoger. This space principally consists of two plains; that of Antioch to the west, and that of Aleppo to the east: the north and the sea-coast are occupied by considerably high mountains, known to the ancients by the names of Amanus and of Rhofus. In general, the

soil of this government is fat and loamy. The lofty and vigorous plants which shoot up every where after the winter rains prove its fertility, but its actual fruitfulness is but little. The greatest part of the lands lie waste; scarcely can we trace any marks of cultivation in the environs of the towns and villages. Its principal produce consists in wheat, barley, and cotton, which are found especially in the flat country. In the mountains, they rather choose to cultivate the vine, mulberry, olive, and fig trees. The sides of the hills towards the sea-coast are appropriated to tobacco, and the territory of Aleppo to pistachios. The pasturage is not to be reckoned, because that is abandoned to the wandering hordes of the Turkmen and Curds.

In the greater part of the pachalics the pacha is, as his title imports, at once the viceroy and farmer-general of the country; but in that of Aleppo he does not possess the latter office. This the Porte has bestowed on a *mebassel* or collector, who is immediately accountable for what he receives. His lease is only for a year. The present rent of his farm is 800 purses (above L. 40,000); but to this must be added the price of the *babouches* (Turkish slippers), or a present of three or four thousand pounds, to purchase the favour of the visir and men in office. For these two sums the farmer receives all the duties of the government; which are, first, The produce of import and export duties on merchandise coming from Europe, India, and Constantinople, and on that exported in exchange. Secondly, The taxes paid by the herds of cattle brought every year by the Turkmen and Curds from Armenia and the Diarbekar, to be sold in Syria. Thirdly, The fifth of the salt works of Djeboul. And lastly, The miri, or land-tax. These united may produce about L. 60,000.

The pacha, deprived of this lucrative branch of the administration, receives a fixed allowance of about L. 8300. This revenue has always been inadequate to the expences; for, besides the troops he is obliged to maintain, and the reparation of the highways and fortresses, the expences of which he is obliged to defray, he is under the necessity of making large presents to the ministers, in order to keep his place; but the Porte adds to the account the contributions he may levy on the Curds and Turkmen, and his extortions from the villages and individuals; nor do the pachas come short of this calculation. Abdi Pacha, who governed 13 or 14 years ago, carried off, at the end of 15 months, upwards of L. 160,000, by laying under contribution every trade, even the very cleaners of tobacco-pipes; and very lately another of the same name has been obliged to fly for similar oppressions. The former was rewarded by the divan with the command of an army against the Russians; but if the latter has not enriched himself, he will be strangled as an extortioner. Such is the ordinary progress of affairs in Turkey!

In consequence of such wretched government, the greater part of the pachalics in the empire are impoverished and laid waste. This is the case in particular with that of Aleppo. In the ancient *defstars*, or registers of imposts, upwards of 3200 villages were reckoned; but at present the collector can scarcely find 400. Such of our merchants as have resided there 20 years, have themselves seen the greater part of the

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Alesia.

environs of Aleppo become depopulated. The traveller meets with nothing but houses in ruins, cisterns rendered useless, and fields abandoned. Those who cultivated them are fled into the towns, where the population is absorbed, but where at least the individual conceals himself among the crowd from the rapacious hand of despotism.

ALERIA, ALALIA, or ALARIA, (anc. geog.), a town of Corsica, situated near the middle of the east side of the island, on an eminence, near the mouth of the river Rotanus mentioned by Ptolemy; built by the Phœceans (Diodorus Siculus). Afterwards Sylla led a colony thither. It is now in ruins, and called *Aleria Distrutta*.

ALES (Alexander), a celebrated divine of the confession of Augsburg, born at Edinburgh the 23d of April 1500. He soon made a considerable progress in school-divinity, and entered the lists very early against Luther, this being then the great controversy in fashion, and the grand field wherein all authors, young and old, used to display their abilities. Soon after, he had a share in the dispute which Patrick Hamilton maintained against the ecclesiastics, in favour of the new faith he had imbibed at Marpurgh. He endeavoured to bring him back to the Catholic religion; but this he could not effect, and even began himself to doubt about his own religion, being much affected by the discourse of this gentleman, and still more by the constancy he showed at the stake, where David Beton archbishop of St Andrew's caused him to be burnt. Beginning thus to waver, he was himself persecuted with so much violence, that he was obliged to retire into Germany, where he became at length a perfect convert to the Protestant religion. The change of religion which happened in England after the marriage of Henry VIII. with Anna Bullen, induced Ales to go to London in 1535. He was highly esteemed by Cranmer archbishop of Canterbury, Latimer, and Thomas Cromwel, who were at that time in high favour with the king. Upon the fall of these favourites, he was obliged to return to Germany; where the elector of Brandenburg appointed him professor of divinity at Francfort upon the Oder, in 1540. But leaving this place upon some disgust, he returned to Leipzig, where he was chosen professor of divinity, and died in March 1565. He wrote a Commentary on St John, on the Epistles to Timothy, and on the Psalms, &c.

ALESA, ALÆSA, or HALESA, (anc. geog.), a town of Sicily, on the Tuscan sea, built, according to Diodorus Siculus, by Archonides of Herbita, in the second year of the 94th Olympiad, or 403 years before Christ; situated on an eminence about a mile from the sea: now in ruins. It enjoyed immunity from taxes under the Romans (Diodorus, Cicero). The inhabitants were called *Halesini* (Cicero, Pliny); also *Alesini*, and *Alesini*.

ALESHAM, a small neat town in Norfolk. It is 15 miles N. of Norwich, and 121 N. E. by N. of London. E. Long. 0. 30. N. Lat. 52. 53. The town consists of about 400 pretty good houses; but the streets are narrow, though well paved.

ALESIA (anc. geog.), called *Alexia* by Livy and others; a town of the Mandubii, a people of Celtic Gaul; situated, according to Cæsar, on a very high hill, whose foot was washed on two sides by two rivers.

VOL. I. Part I.

The town was of such antiquity, that Diodorus Siculus relates it was built by Hercules. It is supposed to be the city of *Alife*, in the duchy of Bugundy, not far from Dijon.

ALET, a town of France, in Lower Languedoc, with a bishop's see. It is remarkable for its baths, and for the grains of gold and silver found in the stream which runs from the Pyrenean mountains, at the foot of which it stands. It is seated on the river Aude, 15 miles S. of Carcassone, and 37 N. W. of Narbonne. E. Long. 2. 5. N. Lat. 42. 59.

ALETRIS, in botany; a genus of the monogynia order, belonging to the hexandria class of plants; and in the natural method ranking under the 10th order, *Coronarie*. The characters are: The *corolla* is monopetalous, funnel-shaped, hexangular, much corrugated, semiquinquefid, and persistent: The *stamina* consist of six subulated filaments, the length of the corolla, and inserted into the base of the divisions of the corolla; the antheræ are oblong and erect: The *pisillum* has an ovate germen; the stylus subulated, and the length of the stamina; the stigma is trifid: The *pericarpium* is an ovated capsule, triquetrous, pointed, and triocular: The *seeds* are numerous. Of this genus botanical writers enumerate five

Species. 1. The *farinosa*, a native of Virginia, and other parts of North America. 2. The *capensis*, a native of the Cape of Good Hope. 3. The *hyacinthoides*, or Guinea aloe. 4. The *zeylanica*, or Ceylon aloe. 5. The *fragrans*, or tree-aloe, a native of Africa. Of these only the first is so hardy as to outlive the winter in Britain, unless placed in a stove; and even this requires to be sheltered under a frame. The flowers appear in June or July, of a whitish green colour. The third and fifth produce fine spikes of white flowers; those of the third kind appearing in July, of the fifth in March or April. By proper management the last kind becomes a stately plant, rising to the height of 12 or 14 feet; the flowers open wide in the evening, and perfume the air of the stove. These send out one or two heads, or tufts, towards their tops, which may be cut off; and after they have lain a week in the stove to heal the wounded parts, they may be planted for increase. The other species seldom or never flower in this country, nor does their appearance otherwise merit notice.

ALETUM, or ALETA (anc. geog.), a town of Celtic Gaul, now extinct. From its ruins arose St Malo in Brittany, at the distance of a mile. Its ruins are called *Guich Aleth* in the British.

ALEUROMANCY, the same with what was otherwise called *alphitomantia*, and *crithomantia*, and means an ancient kind of divination performed by means of meal or flower.

ALEXANDER THE GREAT, king of Macedonia. His father Philip laid the plan of that extensive empire, which his son afterwards executed.—Philip, having made himself master of Greece, began to cast his eyes upon Persia, with a view to retaliate upon that haughty empire the injuries of former times. It was the popular topic of the day. But this prince was cut off in the midst of his enterprise. Such, however, was the influence of Alexander in the assembly of the Grecian states, that he was created general of their combined forces in the room of his father. Having made every

needful

Alexander. needful preparation, at the head of a veteran army he invaded Asia. The lieutenants of Darius, who was then king of Persia, opposed him at the river Granicus, where Alexander obtained a complete victory, after which he pursued his march through Asia. At Issus, near Scanderoon, he was met by Darius in person, at the head of a prodigious army. Here he obtained a second victory; and took the camp of Darius, together with his family, whom he treated with the utmost humanity. Contrary to all the maxims of war, instead of pursuing Darius, he made an excursion into Egypt; and, as far as appears, through no better motives than those of vanity. Here he was acknowledged to be the son of Jupiter Ammon. In the mean time Darius recruited his strength, and got together an army superior to what he brought into the plain of Issus. Alexander having finished his Egyptian expedition, traversed Asia, and passed the Euphrates. At Arbella, a town in Assyria, he met Darius. Here a decisive battle was fought, which put all Persia into the hands of Alexander. His ambition not being satisfied with the conquest of that vast country, he projected an expedition into India. Here he met with great opposition from Porus, a gallant prince, whom in the end he reduced. Beyond the Ganges lay a country still unsubdued. He notified it to his army, that he proposed to pass the river. But these veterans, harassed with the fatigues, and seeing no end of their labour, mutinied, and refused to march further. The disappointed chief was therefore obliged to return. At Babylon he proposed to receive ambassadors, appoint governors, and settle his vast monarchy; but his excesses put an end to his life in the midst of his designs, and in the flower of his age.

The character of this hero is so familiar to every body, that it is almost needless labour to draw it. All the world knows, says Mr Bayle, that it was equally composed of very great virtues and very great vices. He had no mediocrity in any thing but his stature: in his other properties, whether good or bad, he was all extremes. His ambition rose even to madness. His father was not at all mistaken in supposing the bounds of Macedon too small for his son: for how could Macedon bound the ambition of a man, who reckoned the whole world too small a dominion? He wept at hearing the philosopher Anaxarchus say, that there was an infinite number of worlds: his tears were owing to his despair of conquering them all, since he had not yet been able to conquer one. Livy, in a short digression, has attempted to enquire into the events which might have happened, if Alexander, after the conquest of Asia, had brought his arms into Italy? Doubtless things might have taken a very different turn with him; and all the grand projects, which succeeded so well against an effeminate Persian monarch, might easily have miscarried if he had to do with rough hardy Roman armies. And yet the vast aims of this mighty conqueror, if seen under another point of view, may appear to have been confined in a very narrow compass; since, as we are told, the utmost wish of that great heart, for which the whole earth was not big enough, was, after all, to be praised by the Athenians: for it is related, that the difficulties which he encountered in order to pass the Hydaspes, forced him to cry out, "O Athenians, could you believe to what dangers I

expose myself for the sake of being celebrated by you?" But Bayle affirms, that this was quite consistent with the vast unbounded extent of his ambition, as he wanted to make all future time his own, and be an object of admiration to the latest posterity; yet did not expect this from the conquest of worlds, but from books. He was perfectly in the right, says Bayle; "for if Greece had not furnished him with good writers, he would long ago have been as much forgotten as the kings who reigned in Macedon before Amphitryon."

Alexander has been praised upon the score of continency, yet his life could not surely be quite regular in that respect. Indeed, the fire of his early youth appeared so cold towards women, that his mother suspected him to be impotent; and, to satisfy herself in this point, did, with the consent of Philip, procure a very handsome courtesan to lie with him, whose caresses, however, were all to no purpose. His behaviour afterwards to the Persian captive shows him to have had a great command over himself in this particular. The wife of Darius was a finished beauty; her daughters likewise were all beauties; yet this young prince, who had them in his power, not only bestowed on them all the honours due to their high rank, but managed their reputation with the utmost delicacy. They were kept as in a cloyster concealed from the world, and secured from the reach of every dishonourable (not only attack, but) imputation. He did not give the least handle to scandal, either by his visits, his looks, or his words: and for other Persian dames his prisoners, equally beautiful in face and shape, he contented himself with saying gaily, that they gave indeed much pain to his eyes. The amazon Thalestris could not obtain from him a compliance with her gallant request till after a delay of thirteen days. In the mean time, what are we to conclude from his causing his favourite mistress Pancaete to be drawn naked by Apelles, tho' it is true he gave her to the painter, who fell in love with her? What of that immoderate love of boys, which Athenæus relates of him? What of that prodigious number of wives and concubines which he kept?

His excesses with regard to wine were notorious, and beyond all imagination; and he committed, when drunk, a thousand extravagancies. It was owing to wine, that he killed Clytus who saved his life, and burnt Persepolis, one of the most beautiful cities of the East: he did this last indeed at the instigation of the courtesan Thais; but this circumstance made it only the more heinous. It is generally believed, that he died by drinking immoderately: and even Plutarch, who affects to contradict it, owns that he did nothing but drink the whole day he was taken ill.

In short, to sum up the character of this prince, we cannot be of opinion, that his good qualities did in any wise compensate for his bad ones. Heroes make a poise: their actions glare, and strike the senses forcibly; while the infinite destruction and misery they occasion lies more in the shade, and out of sight. One good legislator is worth all the heroes that ever did or will exist. See MACEDON.

ALEXANDER AB ALEXANDRO, a Neapolitan lawyer, of great learning, who flourished toward the end of the 15th and beginning of the 16th century. He followed the profession of the law first at Naples, afterwards

Alexander. afterwards at Rome: but he devoted all the time he could spare to the study of polite literature; and at length he entirely left the bar, that he might lead a more easy and agreeable life with the muses. The particulars of his life are to be gathered from his work intitled *Genialium Dierum*: We are there informed, that he lodged at Rome, in a house that was haunted; and he relates many surprising particulars about the ghost; he says also, that when he was very young, he went to the lectures of Philelphus, who explained at Rome the Tusculan questions of Cicero; he was there also when Nicholas Perot and Domitius Calderinus read their lectures upon Martial. The particular time when he died is not known; but he was buried in the monastery of the Olivets. Tiraquea wrote a learned commentary upon his work, which was printed at Lyons in 1587, and reprinted at Leyden in 1673, with the notes of Dennis Godfrey, Christopher Colerus, and Nicholas Mercerus.

ALEXANDER (Neckham), an eminent English writer in the 12th and 13th centuries, born at St Albans in Hertfordshire. In 1215 he was made abbot of Exeter, and died in 1227. He wrote several works, which were never published; but they are to be found in manuscript in the libraries of England and other countries.

ALEXANDER (Noel), an indefatigable writer of the 17th century, born at Roan in Normandy, 1639. After finishing his studies at Roan, he entered into the order of Dominican friars, and was professed there in 1655. Soon after he went to Paris, to go through a course of philosophy and divinity in the great convent, where he distinguished himself so, that he was appointed to teach philosophy there, which he did for 12 years. Mr Colbert showed him many marks of his esteem; and being determined to omit nothing to perfect the education of his son, afterwards archbishop of Roan, he formed an assembly of the most learned persons, whose conferences upon ecclesiastical history might be of advantage to him. Father Alexander was invited to this assembly, where he exerted himself with so much genius and ability, that he gained the particular friendship of young Colbert, who showed him the utmost regard as long as he lived. These conferences gave rise to Alexander's design of writing an ecclesiastical history; for, being desired to reduce what was material in these conferences to writing, he did it with so much accuracy, that the learned men who composed this assembly, advised him to undertake a complete body of church-history. This he executed with great assiduity, collecting and digesting the materials himself, and writing even the tables with his own hand. He at last completed his work in 1686. Towards the latter part of his life, he was afflicted with the loss of his sight; a most inexpressible misfortune to one whose whole pleasure was in study, yet he bore it with great patience and resignation. He died merely of a decay of nature, 1724, in the 86th year of his age.

ALEXANDER SEVERUS, emperor of Rome, succeeded Heliogabalus about A. D. 222, when but 16 years of age. His mother's name was Mammæa, and by her advice he in a great measure regulated his conduct. He applied himself to the reformation of abuses, the state having been greatly disordered by the vicious conduct of his predecessor; he was a most strict lover of justice,

an encourager of learning and learned men, and favourable to the Christians. He made a successful expedition against the Persians; but endeavouring to reform his troops, which had grown very licentious under the late bad government, they murdered him at the instigation of Maximinus in the 29th year of his age, together with his mother, A. D. 235.

ALEXANDER VI. (Pope), had four bastards when he was cardinal, for one of which he had so great affection, that he stuck at nothing to raise him. Designing to poison some cardinals, he was poisoned himself, A. D. 1503. See **BORGIA**.

ALEXANDER VII. (Pope). See **CHIGI**.

ALEXANDER Bishop of Lincoln in the reigns of Henry I. and Stephen, was a Norman by birth, and nephew of the famous Roger, bishop of Salisbury, who first made him archdeacon of Salisbury, and afterwards, by his interest with the king, raised him to the mitre. Alexander was consecrated at Canterbury, July 22. 1123. Having received his education under his uncle the bishop of Salisbury, and been accustomed to a splendid way of living, he affected show and state more than was suitable to his character, or consistent with his fortunes. This failing excepted, he was a man of worth and honour, and every way qualified for his station. The year after his consecration, his cathedral church at Lincoln having been accidentally burnt down, he rebuilt it, and secured it against the like accident for the future by a stone roof. This prelate increased the number of prebends in his church, and augmented its revenues with several manors and estates. In imitation of the barons and some of the bishops, particularly his uncle the bishop of Salisbury, he built three castles; one at Banbury, another at Sleaford, and a third at Newark. He likewise founded two monasteries; one at Haverholm, for regular canons and nuns together, the other at Tame for white friars. He went twice to Rome in the years 1142 and 1144. The first time, he came back in quality of the pope's legate, for the calling a synod, in which he published several wholesome and necessary canons. In August 1147, he took a third journey to the pope, who was then in France; where he fell sick through the excessive heat of the weather, and returning with great difficulty to England, he died in the 24th year of his prelacy.

ALEXANDER (William), earl of Stirling, an eminent Scots statesman and poet in the reigns of James VI. and Charles I. who, after travelling with the duke of Argyll as his tutor or companion, wrote a poetical complaint of his unsuccessful love of some beauty, under the title of *Aurora*. He then removed to the court of James VI. where he applied to the more solid parts of poetry, forming himself upon the plan of the Greek and Roman tragedians. In 1607, he published some dramatic performances, intitled *The Monarchic Tragedies*, dedicated to king James; who was so well pleased with them, as to call him his philosophical poet. After this, he is said to have written *A supplement* to complete the third part of Sir Philip Sidney's *Arcadia*; and in 1613, he produced a poem called *Doomsday, or the Great Day of Judgment*. He was made gentleman-usher to prince Charles, and master of the requests; was knighted; and obtained a grant of Nova Scotia, where he projected the settlement of a colony, but afterward sold it to the French. In 1626, he was made secretary of state for

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Scotland; was created first viscount, and then earl, of Stirling; and died in 1640.

ALEXANDER I. (St), whom St Ireneus reckons the fifth bishop of Rome, succeeded St Evaristus in the year 109, and died in the year 119. There is no account of his life; and the epistles which are attributed to him are suppositious.

ALEXANDER II. king of Scotland, succeeded his father William in 1213, at 16 years of age. He made an expedition into England, to oppose the tyranny of king John; who returned the visit, and was offered battle by Alexander, but refused it. He took the city of Carlisle from Henry III. which was afterwards exchanged for Berwick. Alexander died in 1249, in the 51st year of his age, and 35th of his reign; and left for his successor, his son—

ALEXANDER III. who was crowned king of Scotland in 1249. The Cummings, lords of Scotland, took arms against him; and taking him prisoner, confined him at Striveling: but he was afterwards released by his subjects. He married the daughter of Henry III. king of England; and was at length killed by a fall from his horse, on the 10th of April 1290, after having reigned 42, or according to others 37, years.

ALEXANDERS, in botany. See SMYRNIUM.

ALEXANDRIA, (anc. geog). a mountain of Mysia, on the sea-coast, forming a part of mount Ida, where Paris gave judgment on the three goddesses.

ALEXANDRETTA, by the Turks called *Scanderoon*; a town in Syria, at the extremity of the Mediterranean sea. It is the port of Aleppo, from which it is distant 28 or 30 leagues. It is now, properly speaking, nothing else but a village, without walls, in which the tombs are more numerous than the houses, and which entirely owes its existence to the road which it commands. This is the only road, in all Syria, where vessels anchor on a solid bottom, without their cables being liable to chafe: but in other respects it has many inconveniences. It is infested, during winter, by a peculiar wind, called by the French sailors *le Raguier*, which, rushing from the snowy summits of the mountains, frequently forces ships to drag their anchors several leagues: And when the snow begins to cover the mountains which surround the Gulph, tempestuous winds arise which prevent vessels from entering for three or four months together. The road also to Aleppo by the plain is invested by Curd robbers, who conceal themselves in the neighbouring rocks, and frequently attack and plunder the strongest caravans. But the worst circumstance is the extreme unwholesomeness of the air, occasioned here by stagnant waters and mephitic exhalations. It may be affirmed that this every year carries off one-third of the crews of the vessels which remain here during the summer; nay, ships frequently lose all their men in two months. The season for this epidemic disorder is principally from May to the end of September: it is an intermitting fever of the most malignant kind; and is accompanied with obstructions of the liver, which terminate in a dropsy. To this baneful epidemic, Alexandretta, from its situation, seems to be irremediably condemned: for the plain on which the town is built is so low and flat, that the rivulets, finding no declivity, can never reach the sea. When they are swelled by the winter rains, the sea, swelled likewise by tempests, hinders their discharging

themselves into it: hence their waters, forced to spread themselves, form lakes in the plain. On the approach of the summer, the waters becoming corrupted by the heat, exhale vapours equally corrupt, and which cannot disperse, being confined by the mountains that encircle the gulph. The entrance of the bay besides lies to the west, which in those countries is the most unhealthy exposure when it corresponds with the sea. The labour necessary to remedy this would be immense, and after all insufficient; and, indeed, such an undertaking would be absolutely impossible under a government like that of the Turks. A few years ago, Mr Volney informs us, the merchants of Aleppo, disgusted with the numerous inconveniences of Alexandretta, wished to abandon that port and carry the trade to Latakia. They proposed to the Pacha of Tripoli to repair the harbour at their own expence, provided he would grant them an exemption from all duties for ten years. To induce him to comply with their request, the agent they employed talked much of the advantage which would, *in time*, result to the whole country: "But what signifies it to me what may happen *in time*," replied the Pacha? I was yesterday at Marach; to-morrow, perhaps, I shall be at Djedda: Why should I deprive myself of present advantages, which are certain, for future benefits I cannot hope to partake?" The European factors were obliged therefore to remain at Skandaroon. There are three of these factors, two for the French, and one for the English and Venetians. The only curiosity which they have to amuse strangers with consists in six or seven marble monuments, sent from England, on which you read: *Here lies such a one, carried off in the flower of his age, by the fatal effects of a contagious air.* The sight of these is the more distressing, as the languid air, yellow complexion, livid eyes, and dropsical bellies of those who show them, make it but too probable they cannot long escape the same fate. It is true, they have some resource in the village of Bailan, the pure air and excellent waters of which surprizingly restore the sick. The Aga, for some years past, has applied the duties of the custom-house of Alexandretta to his own use, and rendered himself almost independent of the Pacha of Aleppo. The Turkish empire is full of rich rebels, who frequently die in peaceable possession of their usurpations.

ALEXANDRIA, now *Scandaria*, by Athenæus called *Ægum*; a city of Lower Egypt, and for a long time its capital. This city was built by Alexander the Great, soon after the overthrow of Tyre, about 333 years before Christ. It is situated on the Mediterranean, twelve miles west of that mouth of the Nile anciently called *Canopicum*; and lies in E. Long. 30. 19. N. Lat. 31. 10.

Alexander is said to have been induced to build this city, on account of its being conveniently situated for a fine port; and so sudden was his resolution, that after he had directed where every public structure was to be placed, fixed the number of temples, and the deities to whom they should be dedicated, &c. there were no instruments at hand proper for marking out the walls, according to the custom of those times. Upon this, a workman advised the king to collect what meal was among the soldiers, and to sift it in lines upon the ground, whereby the circuit of the walls would be sufficiently marked out. This advice was followed; and

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Alexandria, and the new method of marking out the walls was, by Aristander, the king's soothsayer, interpreted as a preface of the city's abounding with all the necessities of life. Nor was he deceived in his prediction; for Alexandria soon became the staple, not only for merchandise, but also for all the arts and sciences of the Greeks.

Alexandria was a league and a half long, by one-third in breadth, which made the circumference of its walls about four leagues. Lake Mareotis bathed its walls on the south, and the Mediterranean on the north. It was intersected lengthwise by straight parallel streets. This direction left a free passage to the northerly wind, which alone conveys coolness and salubrity into Egypt. A street of 2000 feet wide began at the gate of the sea, and terminated at the gate of Canopus. It was decorated by magnificent houses, by temples, and by public buildings. In this extensive range, the eye was never tired with admiring the marble, the porphyry, and the obelisks, which were destined at some future day to embellish Rome and Constantinople. This street, the handsomest in the universe, was intersected by another of the same breadth, which formed a square at their junction of half a league in circumference. From the middle of this great place, the two gates were to be seen at once, and vessels arriving under full sail from the north and from the south.

A mole of a mile in length stretched from the continent to the isle of Pharos, and divided the great harbour into two. That which is to the northward preserved its name. A dyke drawn from the island to the rock whereon was built the Pharos, secured it from the westerly winds. The other was called *Eunostos*, or the Safe Return. The former is called at present the new, the latter the old harbour: a bridge that joins the mole to the city, served for a communication between them. It was raised on lofty pillars sunk into the sea, and left a free passage for ships. The palace, which advanced beyond the promontory of *Lochias*, extended as far as the dyke, and occupied more than a quarter of the city. Each of the Ptolemies added to its magnificence. It contained within its inclosure, the museum, an asylum for learned men, groves, and buildings worthy of royal majesty, and a temple where the body of Alexander was deposited in a golden coffin. The infamous Seleucus Cibyastes violated this monument, carried off the golden coffin, and put a glass one in its place. In the great harbour was the little island of Anti-Rhodes, where stood a theatre, and a royal place of residence. Within the harbour of *Eunostos* was a smaller one, called *Kibotos*, dug by the hand of man, which communicated with Lake Mareotis by a canal. Between this canal and the palace was the admirable temple of Serapis, and that of Neptune near the great place where the market was held. Alexandria extended likewise along the southern banks of the lake. Its eastern part presented to view the gymnasium, with its porticoes of more than 600 feet long, supported by several rows of marble pillars. Without the gate of Canopus was a spacious circus for the chariot races. Beyond that, the suburb of Nicopolis ran along the seashore, and seemed a second Alexandria. A superb amphitheatre was built there with a race-ground, for the celebration of the quinquennialia.

Such is the description left us of Alexandria by the ancients, and above all by Strabo.

The architect employed by Alexander in this undertaking was the celebrated Dinocrates, who had acquired so much reputation by rebuilding the temple of Diana at Ephesus. The city was first rendered populous by Ptolemy Soter, one of Alexander's captains, who, after the death of the Macedonian monarch, being appointed governor of Egypt, soon assumed the title of king, and took up his residence at Alexandria, about 304 years before Christ.

In the 30th year of Ptolemy Soter's reign, he took his son Ptolemy Philadelphus partner with him in the empire; and by this prince the city of Alexandria was much embellished. In the first year of his reign the famous watch-tower of Pharos was finished. It had been begun several years before by Ptolemy Soter; and, when finished, was looked upon as one of the wonders of the world. The same year, the island of Pharos itself, originally seven furlongs distant from the continent, was joined to it by a causeway. This was the work of Dexiphanes, who completed it at the same time that his son put the last hand to the tower. The tower was a large square structure of white marble; on the top of which fires were kept constantly burning, for the direction of sailors. The building cost 800 talents; which, if Attic, amounted to L. 165,000; if Alexandrian, to twice that sum.

The architect employed in this famous structure fell upon the following contrivance to usurp the whole glory to himself.—Being ordered to engrave upon it the following inscription, "King PTOLEMY to the Gods the Saviours, for the benefit of Sailors;" instead of the king's name he substituted his own, and then filling up the hollow of the marble with mortar, wrote upon it the above mentioned inscription. In process of time, the mortar being wore off, the following inscription appeared: "SOSTRATUS the CNIDIAN, the son of DEXIPHANES, to the Gods the Saviours, for the benefit of Sailors."

This year also was remarkable for the bringing of the image of Serapis from Pontus to Alexandria. It was set up in one of the suburbs of the city called *Rhacotis*, where a temple was afterwards erected to his honour, suitable to the greatness of that stately metropolis, and called, from the god worshipped there, *Serapeum*. This structure, according to Ammianus Marcellinus, surpassed in beauty and magnificence all others in the world, except the capitol at Rome.—Within the verge of this temple was the famous Alexandrian library. It was founded by Ptolemy Soter, for the use of an academy he instituted in this city; and, by continual additions by his successors, became at last the finest library in the world, containing no fewer than 700,000 volumes. The method followed in collecting books for this library, was, to seize all those which were brought into Egypt by Greeks or other foreigners. The books were transcribed in the museum by persons appointed for that purpose; the copies were then delivered to the proprietors, and the originals laid up in the library. Ptolemy Euergetes, having borrowed from the Athenians the works of Sophocles, Euripides, and Æschylus, returned them only the copies, which he caused to be transcribed in as beautiful a manner as possible; presenting the Athenians at the same time with fifteen talents (upwards of L. 3000 Sterling) for the exchange.

Alexandria.

As the museum was at first in that quarter of the city called *Bruchton*, near the royal palace, the library was placed there likewise; but when it came to contain 400,000 volumes, another library, within the Serapeum, was erected by way of supplement to it, and on that account called the *daughter* of the former. In this second library 300,000 volumes, in process of time, were deposited; and the two together contained the 700,000 volumes already mentioned. In the war carried on by Julius Cæsar against the inhabitants of this city, the library in the Bruchion, with the 400,000 volumes it contained, was reduced to ashes. The library in the Serapeum, however, still remained; and here Cleopatra deposited 200,000 volumes of the Pergamean library, which Marc Antony presented her with. These, and others added from time to time, rendered the new library at Alexandria more numerous and considerable than the former; and though it was often plundered during the revolutions and troubles of the Roman empire, yet it was again and again repaired, and filled with the same number of books.

For 293 years Alexandria was held in subjection by the Ptolemies. Here is a list of these princes, with the dates of their respective reigns.

Ptolemy the son of Lagus, surnamed *Soter*, reigned 39 years, and died in the year of the world 3720. Ptolemy Philadelphus reigned 39 years, and died in 3758. Ptolemy Euergetes reigned 25 years, and died in 3783. Ptolemy Philopator reigned 17 years, and died in 3800. Ptolemy Epiphanes reigned 24 years, and died in 3824. Ptolemy Philometor reigned 37 years, and died in 3861. Ptolemy Euergetes, or Physcon, reigned 53 years, part with his brother Philometor and part alone. He died in 3888. Ptolemy Lathyrus reigned 36 years six months. He died in 3923. Cleopatra, the daughter of Lathyrus and wife of Alexander I. reigned six months. Alexander I. the nephew of Lathyrus, was established in 3924, and died in 3943. Alexander II. the son of Alexander I. was dispossessed by the Alexandrians in 3939. Ptolemy Nothus, or Auletes, the son of Lathyrus, reigned 13 years, and died in 3953. Ptolemy, surnamed *Dionysius* or *Bacchus*, reigned three years eight months, and died in 3957. Cleopatra reigned from 3957, and killed herself in 3974.

This city, as we have already observed, soon became extremely populous, and was embellished both by its own princes and the Romans; but, like most other noted cities of antiquity, hath been the seat of terrible massacres. About 141 years before Christ, it was almost totally depopulated by Ptolemy Physcon. That barbarous monster, without the least provocation, gave free liberty to his guards to plunder his metropolis and murder the inhabitants at their pleasure. The cruelties practised on this occasion cannot be expressed; and the few who escaped were so terrified that they fled into other countries. Upon this, Physcon, that he might not reign over empty houses, invited thither strangers from the neighbouring countries; by whom the city was repopled, and soon recovered its former splendor. On this occasion many learned men having been obliged to fly, proved the means of reviving learning in Greece, Asia Minor, the islands of the Archipelago, and other places, where it was almost totally lost.

The new inhabitants were not treated with much more kindness by Physcon than the old ones had been; for, on their complaining of his tyrannical behaviour, he resolved on a general massacre of the young men. Accordingly, when they were one day assembled in the gymnasium, or place of their public exercises, he ordered it to be set on fire; so that they all perished, either in the flames, or by the swords of his mercenaries, whom the tyrant had placed at all the avenues.

Though Julius Cæsar was obliged to carry on a war for some time against this city, it seems not to have suffered much damage, except the burning of the library already mentioned. Before Cæsar left Alexandria, in acknowledgment of the assistance he had received from the Jews, he confirmed all their privileges there, and even engraved his decree on a pillar of brass. This, however, did not prevent the massacre of 50,000 of them in this city about the year of Christ 67.

The city of Alexandria seems to have fallen into decay soon after this, and to have forfeited many of its ancient privileges, tho' for what offence is not known; but when Adrian visited Egypt, about the year 141, it was almost totally ruined. He repaired both the public and private buildings, not only restoring the inhabitants to their ancient privileges, but heaping new favours upon them; for which they returned him their solemn thanks, and conferred upon him what honours they could while he was present; but as soon as he was gone, they published the most bitter and virulent lampoons against him.

The fickle and satirical humour of the Alexandrians was highly disliked by Adrian, though he inflicted no punishment upon them for it; but when they lampooned Caracalla, he did not let them escape so easily. That tyrant, in the year 215, when he visited their city, having become the subject of their foolish satires, ordered a general massacre by his numerous troops, who were dispersed all over the city. The inhuman orders being given, all were murdered, without distinction of age or sex; so that in one night's time the whole city floated in blood, and every house was filled with carcases. The monster who occasioned this had retired during the night to the temple of Serapis, to implore the protection of that deity; and, not yet satiated with slaughter, commanded the massacre to be continued all the next day; so that very few of the inhabitants remained. As if even this had not been sufficient, he stripped the city of all its ancient privileges; suppressed the academy; ordered all strangers who lived there to depart; and that the few who remained might not have the satisfaction of seeing one another, he cut off all communication of one street with another, by walls built for that purpose, and guarded by troops left there.

Notwithstanding this terrible disaster, Alexandria soon recovered its former splendor, as Caracalla was murdered a short time after. It was long esteemed the first city in the world, next to Rome; and we may judge of its magnificence, and the multitude of people contained in it, from the account of Diodorus Siculus, who relates, that in his time (44 years before Christ) Alexandria had on its rolls 300,000 freemen. Towards the middle of the sixth century, Amrou Ebn el Aas, Omar's general, took it by storm, after a siege of

Alexandria of 14 months, and with the loss of 23,000 men. Heraclius, then emperor of Constantinople, did not send a single ship to its assistance. This prince affords an example very rare in history; he had displayed some vigour in the first year of his reign, and then suffered himself to be lulled into idleness and effeminacy. Awakened suddenly from his lethargy by the noise of the conquests of Cosroes, that scourge of the east, he put himself at the head of his armies, distinguished himself as a great captain from his very first campaign, laid waste Persia for seven years, and returned to his capital covered with laurels: he then became a theologian on the throne, lost all his energy, and amused himself the rest of his life with disputing upon Monotheism, whilst the Arabs were robbing him of the finest provinces of his empire. Deaf to the cries of the unfortunate inhabitants of Alexandria, as he had been to those of the people of Jerusalem, who defended themselves for two years, he left them a sacrifice to the fortunate ascendant of the indefatigable Amrou. All their intrepid youth perished with their arms in their hands.

The victor, astonished at his conquest, wrote to the caliph, "I have taken the city of the west. It is of an immense extent. I cannot describe to you how many wonders it contains. There are 4000 palaces, 4000 baths, 12,000 dealers in fresh oil, 12,000 gardeners, 40,000 Jews who pay tribute, 400 comedians," &c.

At this time, according to the Arabian historians, Alexandria consisted of three cities, *viz.* *Menna*, or the port, which included Pharos, and the neighbouring parts; *Alexandria*, properly so called, where the modern Scanderia now stands; and *Nekita*, probably the Necropolis of Josephus and Strabo.

At that time John, surnamed *the grammarian*, a famous Peripatetic philosopher, being in the city, and in high favour with Amrou Ebn al Aas the Saracen general, begged of him the royal library. Amrou replied, that it was not in his power to grant such a request; but that he would write to the khalif on that head; since, without knowing his pleasure, he dared not to dispose of a single book. He accordingly wrote to Omar, who was then khalif, acquainting him with the request of his friend: To which the ignorant tyrant replied, That if those books contained the same doctrine with the koran, they could be of no use, since the koran contained all necessary truths; but if they contained any thing contrary to that book, they ought not to be suffered; and therefore, whatever their contents were, he ordered them to be destroyed. Pursuant to this order, they were distributed among the public baths; where, for the space of six months, they served to supply the fires of those places, of which there was an incredible number in Alexandria.

After the city was taken, Amrou thought proper to pursue the Greeks who had fled farther up the country; and therefore marched out of Alexandria, leaving but a very slender garrison in the place. The Greeks, who had before fled on board their ships, being apprised of this, returned on a sudden, surprised the town, and put all the Arabs they found therein to the sword: but Amrou, receiving advice of what had happened, suddenly returned, and drove them out of it with great slaughter; after which the Greeks were so intimidated,

that he had nothing farther to fear from them.—A few years after, however, Amrou being deprived of his government by the khalif Othman, the Egyptians were so much displeased with his dismissal that they inclined to a revolt; and Constantine the Greek emperor, having received intelligence of their disaffection, began to meditate the reduction of Alexandria. For this purpose, he sent one Manuel, an eunuch, and his general, with a powerful army, to retake that place; which, by the assistance of the Greeks in the city, who kept a secret correspondence with the imperial forces while at sea, and joined them as soon as they had made a descent, he effected, without any considerable effusion of Christian blood. The khalif, now perceiving his mistake, immediately restored Amrou to his former dignity. This step was very agreeable to the natives; who having had experience of the military skill and bravery of this renowned general, and apprehending that they should be called to an account by the Greeks for their former perfidious conduct, had petitioned Othman to send him again into Egypt.—Upon Amrou's arrival, therefore, at Alexandria, the Copts or natives, with the traitor Al-Mokawkas (who had formerly betrayed to Amrou the fortress of Meffr) at their head, not only joined him, but supplied him with all kinds of provisions, exciting him to attack the Greeks without delay. This he did; and, after a most obstinate dispute which lasted several days, drove them into the town, where, for some time, they defended themselves with great bravery, and repelled the utmost efforts of the besiegers. This so exasperated Amrou, that he swore, "If God enabled him to conquer the Greeks, he would throw down the walls of the city, and make it as easy of access as a *barndy-house*, which lies open to every body." Nor did he fail to execute this menace; for having taken the town by storm, he quite dismantled it, entirely demolishing the walls and fortifications. The lives of the citizens, however, were spared, at least as far as lay in the general's power; but many of them were put to the sword by the soldiers on their first entrance. In one quarter particularly, Amrou found them butchering the Alexandrians with unrelenting barbarity; to which, however, by his seasonable interposition, he put a stop, and on that spot erected a mosque, which he called the *mosque of mercy*.

From this time Alexandria never recovered its former splendor. It continued under the dominion of the khalifs till the year 924, when it was taken by the Magrebians, two years after its great church had been destroyed by fire. This church was called by the Arabs *Al Kaisaria*, or *Cæsarea*; and had formerly been a pagan temple, erected in honour of Saturn by the famous queen Cleopatra.

The city was soon after abandoned by the Magrebians; but in 928 they again made themselves masters of it; their fleet being afterwards defeated by that belonging to the khalif, *Abul Kasem* the Magrebian general retired from Alexandria, leaving there only a garrison of 300 men; of which *Thmaâl*, the khalif's admiral, being apprised, he in a few days appeared before the town, and carried off the remainder of the inhabitants to an island in the Nile called *Abukair*. This was done to prevent Abul Kâsem from meeting with any entertainment at Alexandria, in case he should think proper to return. According to Eutychius, above

Alexandria. 200,000 of the miserable inhabitants perished this year.

What contributed to raise Alexandria to such a prodigious height of splendor as it enjoyed for a long time, was its being the centre of commerce between the eastern and western parts of the world. It was with the view of becoming master of this lucrative trade, that Alexander built this city, after having extirpated the Tyrians who formerly engrossed all the East India traffic. Of the immense riches which that trade afforded, we may form an idea, from considering that the Romans accounted it a point of policy to oppress the Egyptians, especially the Alexandrians; and after the defeat of Zenobia, there was a single merchant of Alexandria who undertook to raise and pay an army out of the profits of his trade. The Greek emperors drew prodigious tributes from Egypt, and yet the khalifs found their subjects in so good circumstances as to screw up their revenues to three hundred millions of crowns.

Though the revolutions which happened in the government of Egypt, after it fell into the hands of the Mahometans, frequently affected this city to a very great degree; yet still the excellence of its port, and the innumerable conveniences resulting from the East-India trade, to whomsoever were masters of Egypt, preserved Alexandria from total destruction, even when in the hands of the most barbarous nations. Thus, in the 13th century, when the barbarism introduced by the Goths, &c. began to wear off from the European nations, and they acquired a taste for the elegancies of life, the old mart of Alexandria began to revive; and the port, though far from recovering its former magnificence, grew once more famous by becoming the centre of commerce: but having fallen under the dominion of the Turks, and the passage round the Cape of Good Hope being discovered by the Portuguese in 1499, a fatal blow was given to the Alexandrian commerce, and the city has since fallen into decay.

At present, the city of Alexandria is reckoned to have about 14,000 or 15,000 inhabitants; a strange coluvies of different nations, as well as from various parts of the Turkish empire. They are in general given to thieving and cheating; and (like their predecessors) seditious above all others, were they not kept in awe by the severity of their government. The British and French carry on a considerable commerce with them, and have each a consul residing here. Some Venetian ships also sail thither yearly, but with French colours, and under the protection of France. The subjects of those kingdoms which keep no consul here, are subjected to a tax by the Grand Signior: but the Jews have found out a method of indemnifying themselves for this disadvantage; namely, by selling their commodities cheaper than other foreigners can afford. They are also favoured by the farmers of the revenue; who know, that if they do not pay some private regard to them, the Jews have it in their power to cause fewer merchandizes come into their port during the two years that their farm lasts.

The present city is a kind of peninsula situated between the two ports. That to the westward was called by the ancients the *Portus Eunossus*, now the *Old Port*, and is by far the best; Turkish vessels only are allowed to anchor there: the other called the *New Port*, is for the Christians; at the extremity of one of the arms of which stood the famous Pharos. The New Port,

Nº 10.

the only harbour for the Europeans, is clogged up with Alexandria sand, insomuch that in stormy weather ships are liable to bilge; and the bottom being also rocky, the cables soon chafe and part; so that one vessel driving against a second, and that against a third, they are perhaps all lost. Of this there was a fatal instance 16 or 18 years ago, when 42 vessels were dashed to pieces on the mole in a gale of wind from the north-west, and numbers have been since lost there at different times. If it be asked in Europe, Why do they not repair the New Port? the answer is, That in Turkey they destroy every thing, and repair nothing. The old harbour will be destroyed likewise, as the ballast of vessels has been continually thrown into it for the last 200 years. The spirit of the Turkish government is to ruin the labours of past ages, and destroy the hopes of future times, because the barbarity of ignorant despotism never considers to-morrow.

In time of war, Alexandria is of no importance; no fortification is to be seen; even the Farillon, with its lofty towers, cannot be defended. It has not four cannon fit for service, nor a gunner who knows how to point them. The 500 janisaries, who should form the garrison, reduced to half that number, know nothing but how to smoke a pipe. But Alexandria is a place of which the conquest would be of no value. A foreign power could not maintain itself there, as the country is without water. [This must be brought from the Nile by the kalidj, or canal of 12 leagues, which conveys it thither every year at the time of the inundation. It fills the vaults or reservoirs dug under the ancient city, and this provision must serve till the next year. It is evident, therefore, that were a foreign power to take possession, the canal would be shut, and all supplies of water cut off. It is this canal alone which connects Alexandria with Egypt; for from its situation without the Delta, and the nature of the soil, it really belongs to the deserts of Africa. Its environs are sandy, flat, and sterile, without trees and without houses; where we meet with nothing but the plant which yields the kali, and a row of palm trees which follows the course of the kalidj or canal.]

The city is governed like others in the same kingdom. (See EGYPT.) It hath a small garrison of soldiers, part of which are Janisaries and Assassins; who are very haughty and insolent, not only to strangers, but to the mercantile and industrious part of the people, though ever so considerable and useful. The government is so remiss in favour of these wretches, that Mr Norden informs us, one of them did not hesitate to kill a farmer of the customs, for refusing to take less of him than the duty imposed, and went off unpunished; it being a common salvo among them, that what is done cannot be undone.

The present condition of Alexandria is very despicable, being now so far ruined, that the rubbish in many places overtops the houses. The famous tower of Pharos has long since been demolished, and a castle, called *Farillon*, built in its place. The causeway which joined the island to the continent is broken down, and its place supplied by a stone-bridge of several arches.

Some parts of the old walls of the city are yet standing, and present us with a masterpiece of ancient masonry. They are flanked with large towers, about 200 paces distant from each other, with small ones in the middle.

Alexandria. middle. Below are magnificent casemates, which may serve for galleries to walk in. In the lower part of the towers is a large square hall, whose roof is supported by thick columns of Thebaic stone. Above this are several rooms, over which there are platforms more than 20 paces square. The ancient reservoirs, vaulted with so much art, which extend under the whole town, are almost entire at the end of 2000 years.

Of Cæsar's palace there remain only a few porphyry pillars, and the front, which is almost entire, and looks very beautiful. The palace of Cleopatra was built upon the walls facing the port, having a gallery on the outside, supported by several fine columns. Not far from this palace are two obelisks vulgarly called *Cleopatra's Needles*. They are of Thebaic stone, and covered with hieroglyphics. One is overturned, broken, and lying under the sand; the other is on its pedestal. These two obelisks, each of them of a single stone, are about 60 feet high, by seven feet square at the base. Towards the gate of Rosetta, are five columns of marble on the place formerly occupied by the porticoes of the Gymnasium. The rest of the colonnade, the design of which was discoverable 100 years ago by Maillet, has since been destroyed by the barbarism of the Turks.

But what most engages the attention of travellers is the Pillar of Pompey, as it is commonly called, situated at a quarter of a league from the southern gate. It is composed of red granite. The capital is Corinthian, with palm leaves, and not indented. It is nine feet high. The shaft and the upper member of the base are of one piece of 90 feet long, and 9 in diameter. The base is a square of about 15 feet on each side. This block of marble, 60 feet in circumference, rests on two layers of stone bound together with lead; which, however, has not prevented the Arabs from forcing out several of them, to search for an imaginary treasure. The whole column is 114 feet high. It is perfectly well polished, and only a little shivered on the eastern side. Nothing can equal the majesty of this monument; seen from a distance, it overtops the town, and serves as a signal for vessels. Approaching it nearer, it produces an astonishment mixed with awe. One can never be tired with admiring the beauty of the capital, the length of the shaft, nor the extraordinary simplicity of the pedestal. This last has been somewhat damaged by the instruments of travellers, who are curious to possess a relick of this antiquity; and one of the volutes of the column was immaturely brought down about twelve years ago, by a prank of some English captains, which is thus related by Mr Irwin.

These jolly sons of Neptune had been pushing about the can on board one of the ships in the harbour, until a strange freak entered into one of their brains. The eccentricity of the thought occasioned it immediately to be adopted; and its apparent impossibility was but a spur for the putting it into execution. The boat was ordered; and with proper implements for the attempt, these enterprising heroes pushed ashore, to drink a bowl of punch on the top of Pompey's pillar! At the spot they arrived; and many contrivances were proposed to accomplish the desired point. But their labour was vain; and they began to despair of success, when the genius who struck out the frolic happily sug-

gested the means of performing it. A man was dispatched to the city for a paper kite. The inhabitants were by this time apprized of what was going forward, and flocked in crowds to be witnesses of the address and boldness of the English. The governor of Alexandria was told that these seamen were about to pull down Pompey's pillar. But whether he gave them credit for their respect to the Roman warrior, or to the Turkish government, he left them to themselves; and politely answered, that the English were too great patriots to injure the remains of Pompey. He knew little, however, of the disposition of the people who were engaged in this undertaking. Had the Turkish empire rose in opposition, it would not perhaps at that moment have deterred them. The kite was brought, and flown so directly over the pillar, that when it fell on the other side, the string lodged upon the capital. The chief obstacle was now overcome. A two-inch rope was tied to one end of the string, and drawn over the pillar by the end to which the kite was affixed. By this rope one of the seamen ascended to the top; and in less than an hour, a kind of shroud was constructed, by which the whole company went up, and drank their punch amid the shouts of the astonished multitude. To the eye below, the capital of the pillar does not appear capable of holding more than one man upon it; but our seamen found it could contain no less than eight persons very conveniently. It is astonishing that no accident befel these madcaps, in a situation so elevated, that would have turned a landman giddy in his sober senses. The only detriment which the pillar received, was the loss of the volute beforementioned; which came down with a thundering sound, and was carried to England by one of the captains, as a present to a lady who commissioned him for a piece of the pillar. The discovery which they made amply compensated for this mischief; as without their evidence, the world would not have known at this hour, that there was originally a statue on this pillar, one foot and ankle of which are still remaining. The statue must have been of a gigantic size, to have appeared of a man's proportion at so great an height.

There are circumstances in this story which might give it an air of fiction; were it not demonstrated beyond all doubt. Besides the testimonies of many eye-witnesses, the adventurers themselves have left us a token of the fact, by the initials of their names, which are very legible in black paint just beneath the capital.

Learned men and travellers have made many fruitless attempts to discover in honour of what prince it was erected. The best informed have concluded, that it could not be in honour of Pompey, since neither Strabo nor Diodorus Siculus have spoken of it. The Arabian Abulfeda, in his description of Egypt, calls it *the pillar of Severus*. And history informs us†, that this emperor "visited the city of Alexandria: That he granted a senate to its inhabitants, who until that time, under the subjection of a single Roman magistrate, had lived without any national council, as under the reign of the Ptolemies, when the will of the prince was their only law: That he did not confine his benefactions there; he changed several laws in their favour." This column, therefore, Mr Savary concludes to have been erected by the inhabitants as a mark of their gratitude to Severus. And in a Greek inscription,

Alexandria.

Alexandria. tion, now half effaced, but visible on the west side when the sun shines upon it, and which probably was legible in the time of Abulfeda, he supposes the name of Severus to have been preserved. He further observes, that this was not the only monument erected to him by the gratitude of the Alexandrians: for there is still seen in the midst of the ruins of Antinoë, built by Adrian, a magnificent pillar, the inscription on which is still remaining, dedicated to Alexander Severus.

On the south-west side of the city, at a mile's distance, are situated the catacombs, the ancient burial-place of Alexandria; and although they cannot be compared to those of the ancient Memphis, which the Arabs will not permit to be visited, in order to make the better market of their mummies, it is probable that, the method of embalming being the same, the form of these catacombs can only differ in their proportions.—The Baron de Tott, in describing these, observes, “that Nature not having furnished this part of Egypt with a ridge of rocks, like that which runs parallel with the Nile above Delta, the ancient inhabitants of Alexandria could only have an imitation by digging into a bed of solid rock; and thus they formed Necropolis, or ‘City of the Dead.’ The excavation is from 30 to 40 feet wide, and 200 long and 25 deep, and is terminated by gentle declivities at each end. The two sides, cut perpendicularly, contain several openings, about 10 or 12 feet in width and height, hollowed horizontally; and which form, by their different branches, subterranean streets. One of these, which curiosity has disencumbered from the ruins and sands that render the entrance of others difficult or impossible, contains no mummies, but only the places they occupied. The order in which they were ranged is still to be seen. Niches, 20 inches square, sunk six feet horizontally, narrowed at the bottom, and separated from each other by partitions in the rock, seven or eight inches thick, divide into checkers the two walls of this subterranean vault. It is natural to suppose, from this disposition, that each mummy was introduced with the feet foremost into the cell intended for its reception; and that new streets were opened, in proportion as these dead inhabitants of Necropolis increased.” This observation, he adds, which throws a light on the catacombs of Memphis, may perhaps likewise explain the vast size and multitude, as well as the different elevations, of the pyramids in the Higher and Lower Egypt.

About 70 paces from Pompey's pillar is the khalis, or the canal of the Nile, which was dug by the ancient Egyptians, to convey the water of the Nile to Alexandria, and fill the cisterns under the city. On the side of the khalis are gardens full of orange and lemon trees, and the fields are full of caper and palm trees. On the top of a hill is a tower, on which a centinel is always placed, to give notice, by means of a flag, of the ships that are coming into the port. From this hill may be seen the sea, the whole extent of the city, and the parts round it.

In going along the sea-coast, there is a large bason cut out of the rock that lines the shore. On the sides of this bason, two beautiful saloons are hewn out by the chisel, with benches that run across them. A canal made zig-zag, for the purpose of stopping the sand by its different windings, conveys into them the

water of the sea, as pure and transparent as crystal. *Alexandria, Alexandrian.* Seated on the stone bench, the water rises a little above the waist; while the feet softly repose on a fine sand. The waves of the sea are heard roaring against the rock, and foaming in the canal. The swell enters, raises you up, and leaves you; and thus alternately entering and retiring, brings a continual fresh supply of water, and a coolness which is truly delicious under a burning sky. This place is vulgarly called the *Bath of Cleopatra*. Some ruins announce that it was formerly ornamented.

Alexandria is about 50 leagues north of Cairo. E. Long. 31. 15. N. Lat. 31. 12.

ALEXANDRIA, a strong and considerable city of Italy, belonging to the Duchy of Milan, with a good castle, built in 1178 in honour of Pope Alexander III. This pope made it a bishopric, with several privileges and exemptions. Prince Eugene of Savoy took this city in 1706, after three days siege. The French took it in 1745; but the king of Sardinia, to whom it belongs by the treaty of Utrecht, retook it in 1746. The fortifications of the town are trifling, but the citadel is considerable. It is 15 miles south-east of Cassal, 35 north-by-west of Genoa, and 40 south-by-west of Milan. E. Long. 8. 40. N. Lat. 44. 53. The country about this town is called the *Alexandrin*.

ALEXANDRIA (anc. geog.), a city of Arachosia, called also *Alexandropolis*, on the river Arachotus (Stephanus, Isidorus Characenus).—Another *Alexandria* in Gedrosia, built by Leonatus, by order of Alexander (Pliny).—A third *Alexandria* in Aria, situated at the lake Arias (Ptolemy); but, according to Pliny, built by Alexander on the river Arius.—A fourth in the Bactriana (Pliny).—A fifth *Alexandria*, an inland town of Carmania (Pliny, Ptolemy, Ammian).—A sixth *Alexandria*, or *Alexandropolis*, in the Sogdiana (Isidorus Characenus).—A seventh in India, at the confluence of the Acesines and Indus (Arrian).—An eighth, called also *Alexandretta*, near the Sinus Illicus, on the confines of Syria and Cilicia, now *Scanderoon* (see ALEXANDRETTA), the port-town to Aleppo.—A ninth *Alexandria* of Margiana, which being demolished by the barbarians, was rebuilt by Antiochus the son of Seleucus, and called *Antiochia* of Syria (Pliny); watered by the river Margus, which is divided into several channels, for the purposes of watering the country, which was called *Zotale*. The city was seventy stadia in circuit, according to Pliny; who adds, that, after the defeat of Crassus, the captives were conveyed to this place by Orodes, the king of the Parthians.—A tenth, of the Oxiana, built on the Oxus by Alexander, on the confines of Bactria (Pliny).—An eleventh, built by Alexander at the foot of mount Paropamisus, which was called *Caucasus* (Pliny, Arrian).—A twelfth *Alexandria* in Troas, called also *Troas* and *Antigonia* (Pliny).—A thirteenth on the Iaxartes, the boundary of Alexander's victories towards Scythia, and the last that he built on that side.

ALEXANDRIAN, in a particular sense, is applied to all those who professed or taught the sciences in the school of Alexandria. In this sense, Clemens is denominated *Alexandrinus*, though born at Athens. The same may be said of Apion, who was born at Oafis; and Arostarchus, by birth a Samothracian. The chief Alexandrian philosophers were, Amonius, Plotinus,

Alexandrianus, Origen, Porphyry, Jamblicus, Sopater, Maximus, and Dexippus.

ALEXANDRIAN is more particularly understood of a college of priests, consecrated to the service of Alexander Severus after his deification. Lampridius relates, that, notwithstanding Severus was killed by Maximin, the senate prosecuted his apotheosis; and, for regularity of worship, founded an order of priests, or *sodales*, under the denomination of *Alexandrini*.

ALEXANDRIAN Library. See p. 389, *supra*.

ALEXANDRIAN Manuscript, a famous copy of the Scriptures, consisting of four volumes, in a large quarto size; which contains the whole Bible in Greek, including the Old and New Testament, with the Apocrypha, and some smaller pieces, but not quite complete. This manuscript is now preserved in the British Museum. It was sent as a present to King Charles I. from Cyrillus Lucaris, patriarch of Constantinople, by Sir Thomas Rowe, ambassador from England to the Grand Signior, about the year 1628. Cyrillus brought it with him from Alexandria, where probably it was written. In a schedule annexed to it, he gives this account: That it was written, as tradition informed them, by Thecla, a noble Egyptian lady, about 1300 years ago, not long after the council of Nice. But this high antiquity, and the authority of the tradition to which the patriarch refers, have been disputed; nor are the most accurate biblical writers agreed about its age. Grabe thinks that it might have been written before the end of the fourth century; others are of opinion, that it was not writ till near the end of the fifth century, or somewhat later.

ALEXANDRIAN, or *Alexandrine*, in poetry, a kind of verse consisting of twelve, or of twelve and thirteen syllables alternately; so called from a poem on the life of Alexander, written in this kind of verse by some French poet. Alexandrines are peculiar to modern poetry, and seem well adapted to epic poems. They are sometimes used by most nations of Europe; but chiefly by the French, whose tragedies are generally composed of Alexandrines.

ALEXICACUS, something that preserves the body from harm or mischief. The word amounts to much the same as *alexiterial*.

ALEXICACUS, in antiquity, was an attribute of Neptune, whom the tunny-fishers used to invoke under this appellation, that their nets might be preserved from the *ξίπιας*, or sword-fish, which used to tear them; and that he might prevent the assistance which it was pretended the dolphins used to give the tunnies on this occasion.

ALEXIPHARMICS, in medicine, are properly remedies for expelling or preventing the ill effects of poison: but some of the moderns having imagined, that the animal spirits, in acute distempers, were affected by a malignant poison, the term has been understood to mean medicines adapted to expel this poison by the cutaneous pores, in the form of sweat. In this sense, alexipharmics are the same as sudorifics.

ALEXIS, a Piedmontese. There is a book of "Secrets," which for a long time has gone under his name. It was printed at Basil 1536, in 8vo, and translated from Italian into Latin by Wecher; it has also been translated into French, and printed several times with additions. There is a preface to the piece, wherein Alexis informs us, that he was born of a noble

family; that he had from his most early years applied himself to study; that he had learned the Greek, the Latin, the Hebrew, the Chaldean, the Arabian, and several other languages; that having an extreme curiosity to be acquainted with the secrets of nature, he had collected as much as he could during his travels for 57 years; that he piqued himself upon not communicating his secrets to any person; but that when he was 82 years of age, having seen a poor man who had died of a sickness which might have been cured had he communicated his secret to the surgeon who took care of him, he was touched with such a remorse of conscience, that he lived almost like a hermit: and it was in this solitude that he ranged his secrets in such an order as to make them fit to be published. The hawkers generally carry them, with other books, to the country fairs. These, however, contain only the select remedies of Signor Alexis of Piedmont; the entire collection would make too large a volume for them.

ALEXITERIAL, among physicians, a term of much the same import with *alexipharmic*; though sometimes used in a synonymous sense with amulet.

ALEYN (Charles), an English poet in the reign of Charles I. In 1631, he published two poems on the famous victories of Cressy and Poitiers. He succeeded his father as clerk of the ordnance, and was commissary-general of the artillery to the king at the battle of Edgehill. The next piece he wrote was a poem in honour of Henry VII. and the victory that gained him the crown of England. In 1639, the year before he died, he translated the history of Eurialius and Lucretia, from the Latin epistles of Æneas Sylvius.

ALFANDIGA, the name of the customhouse at Lisbon.

ALFAQUES, among the Moors, the name generally used for their clergy, or those who teach the Mahometan religion; in opposition to the Morabites, who answer to monks among Christians.

ALFATERNA (anc. geog.), the last town of Campania, beyond Vesuvius (Diodorus); the same with *Nocera*, which see. The inhabitants *Alfaterni* (Pliny).

ALFDOUCH, a name given by the Moors to a sort of vermicelli, which they make of flour and water, and are very fond of in their entertainments.

ALFET, in our old customs, denotes a caldron full of boiling water, wherein an accused person, by way of trial or purgation, plunged his arm up to the elbow.

ALFORD, a town in Lincolnshire, with a market on Tuesdays for provisions and corn; and two fairs, on Whit-Tuesday, and November 8. for cattle and sheep. It is seated on a small brook that runs through the town, and is a compact place. A salt spring was discovered here in 1670, from the pigeons which flew thither in great numbers to drink the water; those birds being known to be fond of salt. It contains a purging salt, together with a portion of sea-salt. It is strongly purgative. It is recommended as cooling, cleansing, and attenuating. As a good remedy in the scurvy, jaundice, and other glandular obstructions. It also promotes urine and sweat, and therefore is good in gravelly and other disorders of the kidneys and bladder; and in complaints arising from obstructed perspiration. Alford is six miles from the sea, and 20 N. of Boston. E. Long. 0. 15. N. Lat. 53. 30.

Alfred.

ALFRED, or ÆLFRED, the Great, king of England, was the fifth and youngest son of Æthelwolf king of the West Saxons, and was born at Wantage in Berkshire in 849. He distinguished himself, during the reign of his brother Ethelred, in several engagements against the Danes; and upon his death succeeded to the crown, in the year 871, and the 22d of his age. At his ascending the throne he found himself involved in a dangerous war with the Danes, and placed in such circumstances of distress as called for the greatest valour, resolution, and all the other virtues with which he was adorned. The Danes had already penetrated into the heart of his kingdom; and before he had been a month upon the throne, he was obliged to take the field against those formidable enemies. After many battles gained on both sides, he was at length reduced to the greatest distress, and was entirely abandoned by his subjects. In this situation, Alfred, conceiving himself no longer a king, laid aside all marks of royalty, and took shelter in the house of one who kept his cattle. He retired afterwards to the isle of Æthelney in Somersetshire, where he built a fort for the security of himself, his family, and the few faithful servants who repaired thither to him. When he had been about a year in this retreat, having been informed that some of his subjects had routed a great army of the Danes, killed their chiefs, and taken their magical standard (A), he issued his letters, giving notice where he was, and inviting his nobility to come and consult with him. Before they came to a final determination, Alfred, putting on the habit of a harper, went into the enemy's camp, where, without suspicion, he was every where admitted, and had the honour to play before their princes. Having thereby acquired an exact knowledge of their situation, he returned in great secrecy to his nobility, whom he ordered to their respective homes, there to draw together each man as great a force as he could; and upon a day appointed there was to be a general rendezvous at the great wood, called *Selwood*, in Wiltshire. This affair was transacted so secretly and expeditiously, that, in a little time, the king, at the head of an army, approached the Danes, before they had the least intelligence of his design. Alfred, taking advantage of the surprise and terror they were in, fell upon them, and totally defeated them at Æthendune, now Eddington. Those who escaped fled to a neighbouring castle, where they were soon besieged, and obliged to surrender at discretion.

Alfred granted them better terms than they could expect. He agreed to give up the whole kingdom of the East-Angles to such as would embrace the Christian religion, on condition they would oblige the rest of their countrymen to quit the island, and, as much as it was in their power, prevent the landing of any more foreigners. For the performance thereof he took hostages; and when, in pursuance of the treaty, Guthrum the Danish captain came, with thirty of his chief officers, to be baptized, Alfred answered for him at the font, and gave him the name of *Æthelstane*; and certain laws were drawn up betwixt the king and Guthrum for the regulation and government of the Danes settled in England. In 884, a fresh number of Danes landed in Kent, and laid siege to Rochester; but the king coming to the relief of that city, they were obliged to abandon their design. Alfred had now great success; which was chiefly owing to his fleet, an advantage of his own creating. Having secured the sea-coasts, he fortified the rest of the kingdom with castles and walled towns; and he besieged and recovered from the Danes the city of London, which he resolved to repair, and to keep as a frontier (B).

After some years respite, Alfred was again called into the field: for a body of Danes, being worsted in the west of France, came with a fleet of 250 sail on the coast of Kent; and having landed, fixed themselves at Apple-tree: shortly after, another fleet of 80 vessels coming up the Thames, the men landed, and built a fort at Middleton. Before Alfred marched against the enemy, he obliged the Danes, settled in Northumberland and Essex, to give him hostages for their good behaviour. He then moved towards the invaders, and pitched his camp between their armies, to prevent their junction. A great body, however, moved off to Essex; and crossing the river, came to Farnham in Surry, where they were defeated by the king's forces. Meanwhile the Danes settled in Northumberland, in breach of treaty, and notwithstanding the hostages given, equipped two fleets; and, after plundering the northern and southern coasts, sailed to Exeter, and besieged it. The king, as soon as he received intelligence, marched against them; but before he reached Exeter, they had got possession of it. He kept them, however, blocked up on all sides; and reduced them at last to such extremities, that they were obliged to eat their horses, and were even ready to devour each other. Being at length rendered desperate, they made a general sally on the besiegers;

(A) "This (says Sir John Spelman) was a banner with the image of a raven magically wrought by the three sisters of Hinguar and Hubba, on purpose for their expedition, in revenge of their father Lodebroch's murder, made, they say, almost in an instant, being by them at once begun and finished in a noontide, and believed by the Danes to have carried great fatality with it, for which it was highly esteemed by them. It is pretended, that being carried in battle, towards good success it would always seem to clap its wings, and make as if it would fly; but towards the approach of mishap, it would hang down and not move." *Life of Alfred*, p. 61.

(B) The Danes had possessed themselves of London in the time of his father; and had held it till now as a convenient place for them to land at, and fortify themselves in; neither was it taken from them but by a close siege. However, when it came into the king's hands, it was in a miserable condition, scarce habitable, and all its fortifications ruined. The king, moved by the importance of the place, and the desire of strengthening his frontier against the Danes, restored it to its ancient splendor. And observing, that, through the confusion of the times, many, both Saxons and Danes, lived in a loose disorderly manner, without owning any government, he offered them now a comfortable establishment, if they would submit and become his subjects. This proposition was better received than he expected; for multitudes growing weary of a vagabond kind of life, joyfully accepted such an offer. *Chron. Sax.* p. 88.

Alfred. siegers; but were defeated, though with great loss on the king's side. The remainder of this body of Danes fled into Essex, to the fort they had built there, and to their ships. Before Alfred had time to recruit himself, another Danish leader, whose name was Laf, came with a great army out of Northumberland, and destroyed all before him, marching on to the city of Werheal in the west, which is supposed to be Chester, where they remained the rest of that year. The year following they invaded North-Wales; and after having plundered and destroyed every thing, they divided, one body returning to Northumberland, another into the territories of the East-Angles; from whence they proceeded to Essex, and took possession of a small island called *Merefig*. Here they did not long remain: for having parted, some sailed up the river Thames, and others up the Lea-road; where drawing up their ships, they built a fort not far from London, which proved a great check upon the citizens, who went in a body and attacked it, but were repulsed with great loss: at harvest-time the king himself was obliged to encamp with a body of troops in the neighbourhood of the city, in order to cover the reapers from the excursions of the Danes. As he was one day riding by the side of the river Lea, after some observation, he began to think that the Danish ships might be laid quite dry: this he attempted, and succeeded; so that the Danes deserted their fort and ships, and marched away to the banks of the Severen, where they built a fort, and wintered at a place called *Quatbrig* (c). Such of the Danish ships as could be got off, the Londoners carried in to their own road; the rest they burnt and destroyed.

Alfred enjoyed a profound peace during the three last years of his reign, which he chiefly employed in establishing and regulating his government, for the security of himself and his successors, as well as the ease and benefit of his subjects in general. After a troublesome reign of 28 years, he died on the 28th of October A. D. 900; and was buried at Winchester, in Hyde-abbey, under a mounment of porphyry.

All our historians agree in distinguishing him as one of the most valiant, wisest, and best of kings that ever reigned in England; and it is also generally allowed, that he not only digested several particular laws still in being, but that he laid the first foundation of our present happy constitution. There is great reason to believe that we are indebted to this prince for trials by juries; and the doomsday book, which is preserved in the exchequer, is thought to be no more than another edition of Alfred's book of Winchester, which contained a survey of the kingdom. It is said also, that he was the first who divided the kingdom into shires: what is ascribed to him is not a bare division of the country, but the settling a new form of judicature; for after having divided his dominions into shires, he subdivided each shire into three parts, called *trythings*. There are some remains of this ancient division in the ridings of Yorkshire, the laths of Kent, and the three

parts of Lincolnshire. Each trything was divided into hundreds or wapentakes; and these again into tythings or dwellings of ten householders: each of these householders stood engaged to the king, as a pledge for the good behaviour of his family, and all the ten were mutually pledges for each other; so that if any one of the tythings was suspected of an offence, if the head boroughs or chiefs of the tything would not be security for him, he was imprisoned; and if he made his escape, the tything and hundred were fined to the king. Each shire was under the government of an earl, under whom was the reive, his deputy; since, from his office, called *shire-reive* or *sheriff*. And so effectual were these regulations, that it is said he caused bracelets of gold to be hung up in the highways, as a challenge to robbers, and they remained untouched.

In private life, Alfred was the most amiable man in his dominions; of so equal a temper, that he never suffered either sadness or unbecoming gaiety to enter his mind; but appeared always of a calm, yet cheerful disposition, familiar to his friends, just even to his enemies, kind and tender to all. He was a remarkable œconomist of his time; and Asserius has given us an account of the method he took for dividing and keeping an account of it: he caused six wax-candles to be made, each of 12 inches long, and of as many ounces weight; on the candles the inches were regularly marked, and having found that one of them burnt just four hours, he committed them to the care of the keepers of his chapel, who from time to time gave him notice how the hours went: but as in windy weather the candles were wasted by the impression of the air on the flame, to remedy this inconvenience, he invented lanterns, there being then no glass in his dominions.

This prince, we are told, was 12 years of age before a master could be procured in the western kingdom to teach him the alphabet; such was the state of learning when Alfred began to reign. He had felt the misery of ignorance; and determined even to rival his contemporary Charlemagne in the encouragement of literature. He is supposed to have appointed persons to read lectures at Oxford, and is thence considered as the founder of that university. By other proper establishments, and by a general encouragement to men of abilities, he did every thing in his power to diffuse knowledge throughout his dominions. Nor was this end promoted more by his countenance and encouragement than by his own example and his writings. For notwithstanding the lateness of his initiation, he had acquired extraordinary erudition; and, had he not been illustrious as a king, he would have been famous as an author. His works are, 1. *Breviarum quoddam collectum ex Legibus Trojanorum*, &c. lib. I. A Breviary collected out of the Laws of the Trojans, Greeks, Britons, Saxons, and Danes, in one book. Leland saw this book in the Saxon tongue, at Christ-church in Hampshire. 2. *Visi-Saxonum Leges*, lib. I. The laws of the West-Saxons, in one book. Pitts tells us, that it is in Ben-

Alfred.

(c) The king's contrivance is thought to have produced the meadow between Hertford and Bow; for at Hertford was the Danish fort, and from thence they made frequent excursions on the inhabitants of London. Authors are not agreed as to the method the king pursued in laying dry the Danish ships: Dugdale supposes that he did it by straitening the channel; but Henry of Huntingdon alleges, that he cut several canals, which exhausted its water.

Alfred
||
Algebra.

net-College library, at Cambridge. 3. *Instituta quedam*, lib. 1. Certain Institutes, in one book. This is mentioned by Pitts, and seems to be the second capitulation with Guthrum. 4. *Contra judices iniquos*, lib. 1. An Invektive against Unjust Judges, in one book. 5. *Acta Magistratum suorum*, lib. 1. Acts of his Magistrates, in one book. This is supposed to be the book of judgments mentioned by Horne; and was, in all probability, a kind of reports, intended for the use of succeeding ages. 6. *Regum fortune variae*, lib. 1. The various Fortunes of Kings, in one book. 7. *Dicta sapientum*, lib. 1. The Sayings of Wise Men, in one book. 8. *Parabolæ et sales*, lib. 1. Parables and pleasant Sayings, in one book. 9. *Collectiones chronicorum*. Collection of Chronicles. 10. *Epistolæ ad Wulfsigium Episcopum*, lib. 1. Epistles to Bishop Wulfsig, in one book. 11. *Manuale meditationum*. A Manual of Meditations.—Besides those original works, he translated many authors from the Latin, &c. into the Saxon language, viz. 1. Bede's History of England, 2. Paulinus Orosius's History of the Pagans. 3. St Gregory's Pastoral, &c. The first of these, with his prefaces to the others, together with his laws, were printed at Cambridge, 1644. His laws are likewise inserted in Spelman's Councils. 4. *Boethius de Consolatione*, lib. V. Boethius's Consolations of Philosophy, in five books. Dr Plot tells us, king Alfred translated it at Woodstock, as he found in a MS. in the Cotton Library. 5. *Æsopi fabulæ*, Æsop's Fables: which he is said to have translated from the Greek both into Latin and Saxon. 6. *Psalterium Davidicum*, lib. 1. David's Psalter, in one Book. This was the last work the King attempted, death surprising him before he had finished it; it was, however, completed by another hand, and published at London in 1640, in quarto, by Sir John Spelman. Several others are mentioned by Malmesbury; and the old history of Ely asserts, that he translated the Old and New Testaments.

The life of this great king was first written by Asferius Menevensis; and first published by Archbishop Parker, in the old Saxon character, at the end of his edition of Hassingham's history, printed in 1674, fol.

ALGA, in botany, the trivial name of the lichen, fucus, and several other plants of the cryptogamia class.

ALGÆ, FLAGS; one of the seven families or natural tribes into which the whole vegetable kingdom is divided by Linnæus, in his *Philosophia Botanica*. They are defined to be plants, whose root, leaf, and stem are

all one. Under this description are comprehended all the sea-weeds, and some other aquatic plants. In the sexual system, they constitute the 3d order of the 24th class *Cryptogamia*; in Tournefort, the second genus of the second section, *Marinæ, aut fluviatiles*, of the 17th class, *Asperma vulgo habitæ*; and the 57th order in Linnæus's Fragments of a Natural Method. The discoveries made in this part of the vegetable kingdom are uncertain, and imperfect; and the attempts, in particular, to arrange flags by the parts of the fructification, have not been attended with great success. Dillenius has arranged this order of plants from their general habit and structure; Micheli from the parts of fructification.—Each has considerable merit.

ALGAGIOLA, a small sea-port town in the island of Corsica, fortified with walls and bastions. It was almost destroyed by the malcontents in 1731, but has since been repaired. E Long. 9. 45. N. Lat. 42. 20.

ALGAROT, in chemistry, an Arabic term for an emetic powder, prepared from regulus of antimony, dissolved in acids, and separated by repeated lotions in warm water.

ALGAROTTI (Count), a celebrated Italian, was born at Padua; but the year is not mentioned. Led by curiosity, as well as a desire of improvement, he travelled early into foreign countries; and was very young when he arrived in France in 1736. Here he composed his "Newtonian Philosophy for the Ladies;" as Fontenelle had done his Cartesian Astronomy, in the work intitled, "The Plurality of Worlds." He was noticed by the king of Prussia, who gave him marks of the esteem he had for him. He died at Pisa the 23d of May, 1764; and ordered his own mausoleum, with this inscription to be fixed upon it: "Hic jacet Algarottus, sed non omnis." He is allowed to have been a very great connoisseur in painting, sculpture, and architecture. He contributed much to the reformation of the Italian opera. His works, which are numerous, and upon a variety of subjects, abound with vivacity, elegance, and wit: a collection of them has lately been made, and printed at Leghorn.

ALGARVA, a province in the kingdom of Portugal, 67 miles in length and 20 in breadth; bounded on the W. and S. by the sea, on the E. by the river Guadiana, and on the N. by Alentejo. It is very fertile in figs, almonds, dates, olives, and excellent wines; besides, the fishery brings in larges sums. The capital town is Pharo. It contains four cities, 12 towns, 67 parishes, and 61,000 inhabitants.

A L G E B R A,

Definition
and etymology.

A GENERAL method of computation, wherein signs and symbols, commonly the letters of the alphabet, are made use of to represent numbers, or any other quantities.

This science, properly speaking, is no other than a kind of short-hand, or ready way of writing down a chain of mathematical reasoning on any subject whatever; so that it is applicable to arithmetic, geometry, astronomy, mensuration of all kinds of solids, &c. and the great advantages derived from it appear manifestly to arise from the conciseness and perspicuity with which

every proposition on mathematical subjects can be written down in algebraic characters, greatly superior to the tedious circumlocutions which would be necessary were the reasoning to be written in words at length.

With regard to the etymology of the word *algebra*, it is much contested by the critics. Menage derives it from the Arabic *algiabar*, which signifies the restitution of any thing broken; supposing that the principal part of algebra is the consideration of broken numbers. Others rather borrow it from the Spanish, *algebrista*, a person who replaces dislocated bones; adding,

History. ding, that algebra has nothing to do with fraction. Some, with M. d'Herbelot, are of opinion, that algebra takes its name from Gebar, a celebrated philosopher, chemist, and mathematician, whom the Arabs call *Giaber*, and who is supposed to have been the inventor. Others from *gefr*, a kind of parchment made of the skin of a camel, whereon Ali and Giafer Sadek wrote, in mystic characters, the fate of Mahometanism, and the grand events that were to happen till the end of the world. But others, with more probability, derive it from *geber*; a word whence, by prefixing the article *al*, we have formed *algebra*; which is pure Arabic, and properly signifies the reduction of fractions to a whole number. However, the Arabs, it is to be observed, never use the word *algebra* alone, to express what we mean by it; but always add to it the word *macabelah*, which signifies opposition and comparison: thus *algebra-almacabelah*, is what we properly call *algebra*.

Some authors define algebra, The art of solving mathematical problems; but this is rather the idea of analysis, or the analytic art. The Arabs call it, *The art of restitution and comparison*; or, *The art of resolution and equation*. Lucas de Burgo, the first European who wrote of algebra, calls it, *Regula rei et census*; that is, the rule of the root and its square; the root with them being called *res*, and the square *census*. Others call it *Specious Arithmetic*; and some, *Universal Arithmetic*.

HISTORY. IT is highly probable that the Indians or Arabians first invented this noble art: for it may be reasonably supposed, that the ancient Greeks were ignorant of it; because Pappus, in his mathematical collections, where he enumerates their analysis, makes no mention of any thing like it; and, besides, speaks of a local problem, begun by Euclid, and continued by Apollonius, which none of them could fully resolve; which doubtless they might easily have done, had they known any thing of algebra.

Diaphantus was the first Greek writer of algebra; who published 13 books about the year 800, though only six of them were translated into Latin, by Xylander, in 1575; and afterwards, viz. anno 1621, in Greek and Latin, by M. Bachet and Fermat, with additions of their own. This algebra of Diaphantus's only extends to the solution of arithmetical indeterminate problems.

Before this translation of Diaphantus came out, Lucas Pacciolus, or Lucas de Burgo, a Minorite friar, published at Venice, in the year 1494, an Italian treatise of algebra. This author makes mention of Leonardus Pisanus, and some others, of whom he had learned the art; but we have none of their writings. He adds, that algebra came originally from the Arabs, and never mentions Diaphantus; which makes it probable, that that author was not then known in Europe. His algebra goes no farther than simple and quadratic equations.

After Pacciolus appeared Stifelius, a good author; but neither did he advance any farther.

After him came Scipio Ferreus, Cardan, Tartaglia, and some others, who reached as far as the solution of some cubic equations. Bombelli followed these, and went a little farther. At last came Nun-

nius, Ramus, Schoner, Salignac, Clavius, &c. who all of them took different courses, but none of them went beyond quadratics.

In 1590, Vieta introduced what he called his *Specious Arithmetic*, which consists in denoting the quantities, both known and unknown, by symbols or letters. He also introduced an ingenious method of extracting the roots of equations, by approximations; since greatly improved and facilitated by Raphson, Halley, Maclaurin, Simpson, and others.

Vieta was followed by Oughtred, who, in his *Clavis Mathematica*, printed in 1631, improved Vieta's method, and invented several compendious characters, to shew the sums, differences, rectangles, squares, cubes, &c.

Harriot, another Englishman, cotemporary with Oughtred, left several treatises at his death; and among the rest, an *Analysis*, or *Algebra*, which was printed in 1631, where Vieta's method is brought into a still more commodious form, and is much esteemed to this day.

In 1657, Des Cartes published his geometry, wherein he made use of the literal calculus and the algebraic rules of Harriot; and as Oughtred in his *Clavis*, and Marin. Ghetaldus in his books of mathematical composition and resolution published in 1630, applied Vieta's arithmetic to elementary geometry, and gave the construction of simple and quadratic equations; so Des Cartes applied Harriot's method to the higher geometry, explaining the nature of curves by equations, and adding the constructions of cubic, biquadratic, and other higher equations.

Des Cartes's rule for constructing cubic and biquadratic equations, was farther improved by Thomas Baker, in his *Clavis Geometrica Catholica*, published in 1684; and the foundation of such constructions, with the application of algebra to the quadratures of curves, questions *de maximis et minimis*, the centrobaric method of Guldinus, &c. was given by R. Slusius, in 1668: as also by Fermat in his *Opera Mathematica*, Roberval in the *Mem. de Mathem. et de Physique*, and Barrow in his *Lect. Geomet.* In 1708, algebra was applied to the laws of chance and gaming, by R. de Montmort; and since by de Moivre and James Bernouilli.

The elements of the art were compiled and published by Kersey, in 1671; wherein the specious arithmetic, and the nature of equations, are largely explained, and illustrated by a variety of examples; the whole substance of Diaphantus is here delivered, and many things added concerning mathematical composition and resolution from Ghetaldus. The like has been since done by Prestet in 1694, and by Ozanam in 1703; but these authors omit the application of algebra to geometry: which defect is supplied by Guisnee in a French treatise expressly on the subject published in 1704, and l'Hospital in his analytical treatise of the conic sections in 1707. The rules of algebra are also compendiously delivered by Sir Isaac Newton, in his *Arithmetica Universalis*, first published in 1707, which abounds in select examples, and contains several rules and methods invented by the author.

Algebra has also been applied to the consideration and calculus of infinities; from whence a new and extensive branch of knowledge has arisen, called the *Doctrine of Fluxions*, or *Analysis of Infinites*, or the *Calculus Differentialis*.

P A R T I.

INTRODUCTION.

Introduction.

A QUANTITY which can be measured, and is the object of mathematics, is of two kinds, *Number* and *Extension*. The former is treated of in *Arithmetic*; the latter in *Geometry*.

Numbers are ranged in a scale, by the continued repetition of some one number, which is called the *Root*; and, in consequence of this order, they are conveniently expressed in words, and denoted by characters. The operations of arithmetic are easily derived from the established method of notation, and the most simple reasonings concerning the relations of magnitude.

Investigations by the common arithmetic are greatly limited, from the want of characters to express the quantities that are unknown, and their different relations to one another, and to such as are known. Hence letters and other convenient symbols have been introduced to supply this defect; and thus gradually has arisen the science of *Algebra*, properly called *Universal Arithmetic*.

In the common arithmetic too, the given numbers disappear in the course of the operation, so that general rules can seldom be derived from it; but, in algebra, the known quantities, as well as the unknown, may be expressed by letters, which, through the whole operation, retain their original form; and hence may be deduced, not only general canons for like cases, but the dependence of the several quantities concerned, and likewise the determination of a problem, without exhibiting which, it is not completely resolved. This general manner of expressing quantities also, and the general reasonings concerning their connections, which may be founded on it, have rendered this science not less useful in the demonstration of theorems than in the resolution of problems.

If geometrical quantities be supposed to be divided into equal parts, their relations, in respect of magnitude, or their proportions, may be expressed by numbers; one of these equal parts being denoted by the unit. Arithmetic, however, is used in expressing only the conclusions of geometrical propositions; and it is by algebra that the bounds and application of geometry have been of late so far extended.

The proper objects of mathematical science are number and extension; but mathematical inquiries may be instituted also concerning any physical quantities that are capable of being measured or expressed by numbers and extended magnitudes: And, as the application of algebra may be equally universal, it has been called *The science of quantity in general*.

DEFINITIONS.

1. QUANTITIES which are known are generally represented by the first letters of the alphabet, as a, b, c , &c. and such as are unknown by the last letters, as x, y, z , &c.
2. The sign $+$ (*plus*) denotes that the quantity before which it is placed is to be added. Thus $a+b$ denotes the sum of a and b ; $3+5$ denotes the sum of 3 and 5, or 8. When no sign is expressed, $+$ is understood.

N^o 10.

3. The sign $-$ (*minus*) denotes, that the quantity before which it is placed is to be subtracted. Thus $a-b$ denotes the excess of a above b ; $6-2$ is the excess of 6 above 2, or 4. Note, These characters $+$ and $-$, from their extensive use in algebra, are called *the signs*; and the one is said to be *opposite* or *contrary* to the other.
4. Quantities which have the sign $+$ prefixed to them are called *positive* or *affirmative*; and such as have the sign $-$ prefixed to them are called *negative*.
5. Quantities which have the same sign, either $+$ or $-$, are also said to have *like signs*, and those which have different signs are said to have *unlike signs*. Thus $+a, +b$, have like signs, and $+a, -c$, are said to have unlike signs.
6. The *juxtaposition* of letters as in the same word, expresses the product of the quantities denoted by these letters. Thus ab expresses the product of a and b ; bcd expresses the continued product of b, c , and d . The sign $\times$ also expresses the product of any two quantities between which it is placed.
7. A number prefixed to a letter is called a *numeral coefficient*, and expresses the product of the quantity by that number, or how often the quantity denoted by the letter is to be taken. When no number is prefixed, unit is understood.
8. The *quotient* of two quantities is denoted by placing the *dividend* above a small line and the *divisor* below it. Thus $\frac{18}{3}$ is the quotient of 18 divided by 3, or 6; $\frac{a}{b}$ is the quotient of a divided by b . This expression of a quotient is also called a *fraction*.
9. A quantity is said to be *simple*, which consists of one part or *Term*, as $+a, -abc$; and a quantity is said to be *compound*, when it consists of more than one term, connected by the signs $+$ or $-$. Thus $a+b, a-b+c$, are compound quantities. If there are two terms, it is called a *binomial*; if three, a *trinomial*, &c.
10. Simple quantities, or the terms of compound quantities, are said to be *like*, which consist of the same letter or letters, equally repeated. Thus $+ab, -5ab$, are like quantities; but $+ab$, and $+aab$, are unlike.
11. The equality of two quantities is expressed, by placing the sign $=$ between them. Thus $x+a=b-c$, means that the sum of x and a is equal to the excess of b above c .

When quantities are considered abstractedly, then $+$ and $-$ denote addition and subtraction only, according to Def. 2. and 3. and the terms *positive* and *negative* express the same ideas. In that case, a negative quantity by itself is unintelligible. The sign $+$ also is unnecessary before simple quantities, or before the leading term of a compound quantity which is not negative; though, when such a quantity or term is to be added to another, $+$ must be placed before it, to express that addition; and hence in Def. 2. it is said, that $+$ is understood when no sign is expressed.

In geometry, however, and in certain applications of

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Edinburgh [1810]

4 Enc. 7-1,1

urn:nbn:de:bvb:12-bsb10351493-2